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THE *Journal* OF INDUSTRIAL ENGINEERING

A.I.I.E. CHAPTERS

Vol. IV, No. 4 November, 1953

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THE COVER

The rapid growth of A.I.I.E. is indicated by our cover map, which shows the location of Senior Chapters. As of the date of publication, we have twenty-nine Senior Chapters and twenty-one Student Chapters, with more on the way.

SENIOR CHAPTERS

1. Atlanta
2. Birmingham
3. Cincinnati
4. Cleveland
5. Columbus
6. Dallas-Ft. Worth
7. Dayton
8. East Tennessee
9. Jamshedpur, India
10. New York
11. Pittsburgh
12. Saint Louis
13. San-Francisco-Oakland
14. Syracuse
15. Tri-Cities Kingsport, Tennessee
16. Tulsa
17. Washington, D. C.
18. Chicago
19. Starke County, Ohio
20. Jacksonville
21. Savannah
22. Los Angeles
23. Winston-Salem
24. Louisville
25. Seattle
26. Houston
27. Youngstown
28. San Diego
29. Boston

STUDENT CHAPTERS

A. University of Alabama
B. Columbia University
C. University of Florida
D. Georgia Institute of Technology
E. Lehigh University
F. Northwestern University
G. Oklahoma A. & M. College
H. Ohio State University
I. University of Pittsburgh
J. Syracuse University
K. Texas Technical College
L. University of Witchita
M. Washington University
N. Illinois Institute of Technology
O. Virginia Polytechnic Institute
P. North Carolina State College
Q. University of Tennessee
R. A. & M. College of Texas
S. University of California
T. Montana State College
U. New York University

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AIIE CONSTITUTION

AMERICAN INSTITUTE OF INDUSTRIAL ENGINEERS, INC.
145 North High Street,
Columbus 15, Ohio

CONSTITUTION

ARTICLE I—NAME

Section 1—The name of this organization shall be the American Institute of Industrial Engineers, Inc., hereinafter called the "AIIE."

Section 2—Each local unit of the AIIE shall be known as a Chapter. It shall be identified by inserting in its title the name of the geographical area which it serves.

Example: (Name) Chapter, American Institute of Industrial Engineers.

Section 3—Each Member of the AIIE shall also be a Member of the local chapter serving the area in which he lives. However, a qualified person living in an area where no chapter exists may become a Member-at-Large of the national organization with full rights and privileges.

ARTICLE II—PURPOSE

The purpose of the AIIE shall be:

Section 1—To maintain the practice of industrial engineering on a professional level.

Section 2—To foster a high degree of integrity among the members of the industrial engineering profession.

Section 3—To encourage and assist education and research in areas of interest to the industrial engineer.

Section 4—To promote the interchange of ideas and information among members of the industrial engineering profession.

Section 5—To serve in the public interest by the identification of men qualified to practice as industrial engineers.

ARTICLE III—CODE OF ETHICS

The code of ethics of the AIIE shall be the Canons of Ethics of the National Society of Professional Engineers.

ARTICLE IV—MEMBERSHIP

Section 1—There shall be four classes of membership as follows:

(a) Student Member
(b) Associate Member
(c) Senior Member
(d) Fellow

Fellows, Senior and Associate Members shall be known as "Regular Members" and shall be entitled to vote. Only Fellow and Senior Members shall be entitled to hold Regional and National Offices.

Section 2—Definitions of the four classes of membership are as follows:

(a) A Student Member shall be a regularly enrolled student of an accredited curriculum in industrial engineering.

(b) An Associate Member shall be:
1. a graduate of an industrial engineering curriculum or of an industrial engineering option accredited by The Engineers' Council for Professional Development (ECPD), or
2. a graduate of an engineering curriculum accredited by the ECPD and engaged in industrial engineering practice, or
3. a person holding a state board "Engineer-in-Training" certificate and who is engaged in industrial engineering practice, or
4. a person who can present proof of education and experience in diversified fields of industrial engineering judged by the National Qualifications Committee under rules established by the Board of Trustees to be the approximate equivalent of the above stated qualifications.

(c) A Senior member shall be an Industrial Engineer who has demonstrated his fitness and ability to practice as a professional engineer and shall be:
1. a registered professional engineer engaged in industrial engineering practice, or
2. an Associate member who has had five additional years of experience in responsible positions in the industrial engineering profession, or
3. a person who has had five years of experience in responsible positions in the industrial engineering profession in addition to the requirements for associate membership.

(d) A Fellow shall be an outstanding leader in the profession who is honored by being elected to this class of membership. A Fellow must have given at least 15 years of service to the industrial engineering profession and shall be selected by the Executive Committee and approved by the National Convention. Not more than five percent of the total membership is to be admitted to this group during any one year, the total number never to exceed ten percent of the membership.

Section 3—Any member may withdraw from the AIIE at any time by sending a formal statement to that effect to the Executive Secretary. Chapter members shall route their resignation through the local chapter officers. In event of withdrawal, any refund of unexpended dues will be waived.

Section 4—Any member neglecting to renew his membership by the payment of dues is to be carried on the rolls for at least 45 days after final billing, during which time he is to receive a notification from the Executive Secretary that his membership has lapsed. If his dues have not been received at the end of this period, the member's name shall be dropped from the rolls. Any member so dropped may rejoin the AIIE by making formal application in the usual way and, if accepted, by the payment of initiation fees and current dues.

ARTICLE V—ELECTION OF MEMBERS

Section 1—Persons who wish to join the AIIE and who feel that they have the required qualifications may apply by filing an application blank, obtainable from the national office, with the Executive Secretary. Where the applicant resides in an area where there is a local chapter, the application will be routed through the qualifications committee of the chapter for study and recommendation.

Section 2—After reviewing the applicant's qualifications, the national Qualifications Committee will confer or withhold membership. Findings of the Committee shall be subject to review by the Board of Trustees. The Qualifications Committee shall consist of three members appointed by the President with the approval of the Board of Trustees.

ARTICLE VI—CHAPTERS

Section 1—There shall be two kinds of chapters, namely Senior Chapters and Student Chapters.

Section 2—Senior Chapters shall consist of ten or more regular members (Fellows, Senior Members or Associate Members) of the AIIE who have been granted a charter by the Board of Trustees.

Section 3—Student Chapters shall consist of ten or more Student Members of the AIIE who have been granted a charter by the Board of Trustees.

Section 4—Charters shall be granted to formulate Chapters by the Board of Trustees after the applying Chapter's proposed constitution has been approved

Section 5—Each Student Chapter at the beginning of each school year shall appoint an advisor from the faculty of their university. This advisor, who shall be known as the Honorary Chairman, must be a Member of the AIIE.

ARTICLE VII—ORGANIZATION

Section 1—The National organization of the AIIE shall consist of an association of all the members, divided into regions as specified by the Board of Trustees.

Section 2—The legislative body of the AIIE shall be the National Convention and shall consist of the national officers, delegates from the senior chap-

ters and delegates-at-large from each region.

Section 3—Delegates-at-large shall be appointed by the Vice-President of the region in the number of one delegate-at-large for every 100 regular members or fraction thereof. They shall be reported to the Executive Secretary no less than 30 days before the meeting of the national convention.

Section 4—Each senior chapter shall be entitled to send one voting delegate appointed by the chapter.

Section 5—Voting powers of delegates may be exercised in absentia by the appointment of a proxy. Proxy appointments shall be made in writing by the person or body empowered to appoint the delegate.

Section 6—Three copies of all original and proxy appointments shall be made, one copy delivered to the Executive Secretary prior to the voting, one copy to be held by the appointee and one copy to be retained by the appointing officer. Disputes concerning the right of delegates to serve will be settled by rulings of a Credentials Committee consisting of the members of the Board of Trustees at the Convention.

Section 7—The national convention shall meet every year at such time and place as shall have been determined by the Board of Trustees.

Section 8—The national officers of the AIIE shall be as follows: President, Executive Secretary, Assistant Executive Secretary, Treasurer, two Board Members-at-large, and one Vice-President from each region.

Section 9—The above-mentioned officers shall constitute the Board of Trustees of the AIIE. The past two presidents shall attend meetings of Board of Trustees in advisory capacities. These shall not be empowered to vote nor shall they be counted for purposes of establishing a quorum.

Section 10—All officers except board members-at-large shall have terms of office of one year. Board members-at-large shall serve two years.

Section 11—The officers shall carry such duties as are customarily connected with their offices and shall have such additional duties as may be assigned to them by the national convention or Board of Trustees.

Section 12—A slate of officers, excluding the regional vice-presidents, executive secretary and assistant executive secretary, shall be drawn up yearly by a nominating committee consisting of the vice-presidents or their appointees. At least two and not more than three names shall be put up for each office. Officers shall be elected by a mail vote of the entire regular membership. Ballots will be distributed by the Executive Secretary and will be counted by the Executive Secretary and a Tellers Committee appointed by the President.

Section 13—The Vice-President for each region shall be elected at the same time as the other national officers by the entire regular membership of the region in which he is to serve. At least two and not more than three names for this office shall be drawn up by a nominating committee composed of the chapter presidents and the delegate-at-large from the region. Ballots will be counted as described above. The retiring Vice-President will be responsible for conducting the nominations and for reporting the results to the Executive Secretary in time for inclusion on the ballot.

Section 14—The positions of Executive Secretary and Assistant Executive Secretary shall be filled by appointment by the Board of Trustees.

Section 15—**The President, Executive Secretary, Assistant Executive Secretary, Treasurer, and retiring President shall constitute the Executive Committee,** and shall have the duties and powers delegated to it by the Board of Trustees. To increase representation, members of the Board of Trustees present at meetings of the Executive Committee may be invited by the committee to become voting members of the committee at the meeting visited.

Section 16—A quorum for the Executive Committee shall be three.

Section 17—The Board of Trustees shall exercise powers of the National Convention in the interim between conventions, subject to such restrictions as may be imposed by any convention and subject to the provisions of this constitution.

Section 18—The organization, time of meetings, committees, etc. of the Board of Trustees and the Executive Committee shall be left to the discretion of these two bodies respectively, provided that nothing in this section is construed as conflicting with any other section of this constitution.

Section 19—The Vice-Presidents shall supervise the chapters in their respective regions and shall arrange for regional conferences as stated in the by-laws.

Section 20—The Assistant Executive Secretary shall assist the Executive Secretary and have additional duties as may be delegated to him by the Board of Trustees.

Section 21—A quorum for the national convention shall consist of those present. A quorum for the Board of Trustees shall consist of two-thirds of its membership, fractions not considered.

Section 22—The Executive Secretary and Treasurer, at the close of each fiscal year, shall draw up a budget for the coming year to be presented to the Board of Trustees for approval.

Section 23—Any necessary action pertinent to the proper functioning of the financial status of the AIIE shall be taken by the Board of Trustees.

Section 24—The Board of Trustees shall have the power to change the national dues. Such change is to be effective no sooner than 90 days after publication of the change in the AIIE **Newsletter** or **Journal of Industrial Engineering.**

Section 25—The National Convention, upon recommendation of the Board of Trustees, may provide for financial compensation to any officers of the AIIE.

Section 26—The Executive Committee may provide for financial compensation to any employees of the AIIE.

Section 27—The Treasurer shall prepare and present to the Convention an up-to-date financial statement.

Section 28—The Executive Secretary shall present to the membership by publication in the **Newsletter** or **Journal of Industrial Engineering** or direct mail, an annual financial statement prepared by a certified public accountant. This statement shall appear within 60 days of the end of the fiscal year.

ARTICLE VIII—LOCAL POWERS

Section 1—Each Chapter shall have complete control of all matters of local concern under such restrictions as may be imposed by this Constitution and By-laws and or the National Convention. In no case shall the authority thus conferred be exercised contrary to the ideals and purpose of the AIIE.

Section 2—Each Chapter shall submit to the Board of Trustees for approval any by-laws, amendments or revisions to its constitution which may be enacted from time to time.

Section 3—The officers of each senior chapter shall be the President, Vice-President, Secretary, Treasurer and Directors. When desired, the offices of Secretary and Treasurer may be combined.

Section 4—The governing body of each chapter shall be called the Board of Directors and shall consist of the officers and at least four Directors.

Section 5—The constitution and by-laws of each chapter shall specify the time and manner of electing officers and directors.

ARTICLE IX—SUSPENSION AND EXCLUSION

Section 1—Any member convicted by the chapter to which he belongs of conduct unbecoming a gentleman and a member of his profession shall be dismissed and deprived of his membership. Such action shall require a three-fourths majority vote of all the members of the chapter and shall be reviewed by the Board of Trustees before it becomes effective.

Section 2—The Board of Trustees may expel for cause any unaffiliated member of the AIIE, provided this member is given opportunity to answer the charges pending against him before final action is taken.

Section 3—The National Convention shall have the power, by a three-fourths majority vote, to withdraw or suspend the charter of any chapter for cause upon the recommendation of the Board of Trustees, provided that the chapter shall have been given due notice by the Executive Secretary that such action will be recommended. Such notice shall be accompanied by a state-

ment of the charges against the chapter and the chapter shall be given the opportunity to reply to these charges before final action by the National Convention.

ARTICLE X—SPECIAL CONCESSIONS

Section 1—The Board of Trustees, after careful consideration and by three-fourths majority vote of all Board Members, may grant to a chapter temporary exemption from provisions of this Constitution. The reason for the exemption shall be clearly stated and the period shall be specified and of limited duration. This exemption shall continue only so long as the conditions which warranted it are in existence.

Section 2—The Board of Trustees upon majority vote of its members shall be empowered to call special meetings of the National Convention whenever such action is warranted.

ARTICLE XI—BY-LAWS

The Board of Trustees, by a three-fourths affirmative vote, shall have the power to pass, repeal, or modify any by-laws pertaining to matters not expressly specified in this Constitution.

ARTICLE XII—AMENDMENTS

Section 1—Amendments to this Constitution may be proposed by written petition of ten regular members of the AIIE or by the Executive Committee.

Section 2—Any amendment shall require for its passage a three-fourths affirmative vote of the National Convention.

Section 3—A copy of the proposed amendment shall be sent to each regular member by the Executive Secretary at least sixty days before the National Convention.

Section 4—As an alternate method, a mail vote on a proposed amendment may be taken by the Executive Secretary upon the approval of the Executive Committee. A statement of the proposed amendment shall accompany the ballot sent to each regular member. Ballots shall be counted sixty days after the mailing date. A majority affirmative vote of the members voting shall be necessary to adopt.

ARTICLE XIII—EFFECTIVE DATE

Section 1—This Constitution shall become effective upon ratification by a simple majority of the charter membership.

Section 2—A charter member shall be defined as a Member on the rolls of the AIIE at the time the Constitution is mailed for the vote.

BY-LAWS

ARTICLE I—AWARDS

A distinguished service award of appropriate design and title may be awarded to any member of the AIIE who, in the eyes of the National Convention, has rendered some outstanding service to his profession. No more than one award shall be made at any one convention. Nominations for this award must be submitted to the Executive Secretary either by chapters or by regular members at least five months before the date of the Convention. The Executive Secretary will present the nominations to the Board of Trustees which will make a recommendation to the National Convention.

ARTICLE II—COMMITTEES

Section 1—Standing committees of the AIIE shall be an Executive Committee and Qualifications Committee, both as defined in the Constitution; Professional Practices Committee and an Education Committee. All standing committees shall be appointed by the President and shall perform such duties as may be assigned by him.

Section 2—Special or Technical Committees may be appointed by the President and shall perform such duties as he may assign.

ARTICLE III—SPECIAL DUTIES

Each Vice-President shall check the activities of the chapters in his region and present an annual report to the Executive Secretary. In addition, he shall arrange for a regional conference and he shall encourage a large turnout of the members-at-large. He shall present a brief, written report on his region to the National Convention.

ARTICLE IV—BOARD OF TRUSTEES

Section 1—Any Fellow or Senior member of the AIIE is eligible to become a member of the Board.

Section 2—The Board shall hold at least one meeting a year, the expense of such meeting may be paid from the funds of the National Treasury.

Section 3—The Board of Trustees shall be the administrative body of the AIIE and may delegate duties to the Executive Committee.

Section 4—The National President shall prepare a detailed report to be presented to the National Convention.

Section 5—The Board of Trustees shall have such powers as are necessary to the proper functioning of the AIIE, provided that nothing in this Section shall be construed as contrary to the Constitution and By-Laws, and to the ideals of the organization.

ARTICLE V—FINANCE

Section 1—The fiscal year shall be the calendar year.

*Section 2—For members residing in the United States, the dues shall be as follows: Student Members, two dollars; Associate Members, seven dollars; and Senior Members, twelve and one-half dollars per year. After five years in the Associate classification, members shall pay dues at the Senior rate. The initiation fee for all regular members shall be two dollars with the exception of Student Members who, upon graduation, may transfer to Associate Membership by paying student dues for one additional year.

Section 3—Members of Senior and Student Chapters shall pay local dues as prescribed by the chapter.

ARTICLE VI—MISCELLANEOUS

Section 1—Robert's Parliamentary rules of Order shall be the standard authority for all business transacted.

Section 2—Reports shall be made by every officer of the AIIE, whether National or local, whenever required to do so by the Board of Trustees. Each chapter president shall prepare a report for presentation to the National Convention.

Section 3—The expenses of the Board of Trustees shall be paid from the treasury as directed by the Board.

Section 4—No chapter may have members who are not members in good standing of the AIIE.

Section 5—No faculty advisor of a student chapter shall serve for more than two consecutive years.

**Section 6—The President of the AIIE shall be empowered to appoint, subject to Executive Committee approval, a number of "Directors" to coordinate and administer certain functions for the president.

Directors shall be staff positions assisting the president and cannot be empowered to do anything the president cannot do.

The term of appointment of director shall be for one year and shall begin and end October first.

Directors, while having no vote, may attend regular meetings of the Executive Committee to advise on action to be taken regarding their specific activity.

ARTICLE VII—AMENDMENTS

These By-Laws may be amended at any time by a three-fourths affirmative vote of the Board of Trustees. Any amendment adopted shall become effective thirty days after the date of its adoption except as herein indicated.

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*This section is written to include the amendment voted by the Board of Trustees at their meeting of May 1, 1953.

**This section was added by action of the Board of Trustees at their meeting of May 1, 1953. Note: It is contemplated directors will be established as follows: Director of Committees; Publications; Student Chapters; Membership; Chapter Expansion; and Programs. The term of appointment overlaps that of the regular term of officers. This is done to give the activities a greater degree of stability over the critical period when the new officers are "getting their feet on the ground." The system is also designed to give more prestige to certain key appointive positions.

The Engineer As a Professional Man

By Wyllys G. Stanton

Chairman, National Education Committee, American Institute of Industrial Engineers, Professor of Industrial Engineering, University of Alabama

Engineering is a profession in both the deepest and broadest meaning applied to that concept. It is a profession with a long and honorable past. Civilizations' great advances reflect the history and growth of engineering. Modern practitioners should be aware of their great tradition to help them realize who they are and what the profession means to society. It is the purpose of this paper [1] to show how engineers can be more professional [2] in their attitudes and their work, how it will be of great benefit to them to achieve increased professional standing, and how it will be beneficial to their employers for them to do so.

To start an examination of the value and personal satisfaction engineers will find and employers will receive from the professional aspect of their work it is first necessary to examine what is generally meant by a profession and see how engineering meets a group of standards characterizing this concept. The U.S. Department of Labor defined professional occupations in the Dictionary of Occupational Titles, published in 1939. This definition has been widely circulated and is taken by many as an official definition. It reads as follows:

'The professional occupational group is defined as those which predominately require a high degree of mental activity by the worker and are concerned with theoretical or practical aspects of human endeavor. Such occupations require for the proper performance of the work either extensive and comprehensive academic study, or experience of such scope and character as to provide an equivalent background, or a combination of such experience and education.'

In addition to this definition the late and great Dr. William E. Wickendon, former president of the Case Institute of Technology, has probably given a most thorough analysis of what constitutes a professional man and what constitutes a profession as a group. He points out that there are open professions like music, to which any man may aspire within the bounds of his talents, and closed professions like medicine which may be entered only through legally prescribed processes; individual professions like painting, group professions like law, whose members constitute the bar, which is a special class in society and so on. Dr. Wickendon points out that despite the differences between the patterns of each of the separate professions, there are characteristic features of agreement which link together the various aspects of professional life and endeavor.

The personal characteristics which mark the professional man, in Dr. Wickendon's analysis, are:

1. A type of activity which is marked by a high individual responsibility and dealing with problems on a distinctly intellectual plane.
2. A motive of service as distinguished from exclusive preoccupation with making profits.
3. A motive of self expression which implies a joy and pride in one's work and a self imposed standard of workmanship—one's best.
4. A conscious recognition of social duty, expressed among other ways, by guarding the standards and ideals of one's profession and advancing it in the public understanding and esteem, by sharing advances in professional knowledge, and by rendering gratuitous public service, in addition to that for ordinary compensation.

There is much in the foregoing characteristics which implies that one person cannot constitute a profession by himself. Therefore, it is also important to consider the characteristics of a group which leads to the existence of a profession rather than a collection of tradesmen. These are:

1. A body of knowledge, that is a portion of the whole field of science, and certain arts or skills, held as a common possession and extended by common effort.
2. An educational process of distinctive aims and standards, in the ordering of which the professional group has a recognized responsibility.
3. A standard of qualifications, based upon character, training and competence for admission to the professional group.
4. A standard of conduct based upon courtesy, honor and ethics to guide the practitioner in his relations with his clients, colleagues and the public.
5. A more or less formal recognition of status by one's colleagues or by the state or both, as a basis of good standing.
6. An organization of the professional group devoted to its common advancement and social duty rather than to the maintenance of an economic monopoly.

To these characteristics proposed by Dr. Wickendon, the writer would like to add two others, which may to some extent be implied in the foregoing, but which he believes will be worthy of specific consideration. These are:

1. Aggressive contact with other professions to obtain their assistance in the handling of problems which may be on the borderlines between the definite subject matter ordinarily covered by either of them.
2. The existence and utilization of a sub-professional group of persons who work with the members of the professional group and assist them by performing some of the simple routine procedures, under professional guidance.

Let us see how well engineers and engineering measure up to the tests of a profession that have just been given.

On the first point, a body of knowledge, an art and science of the profession, there is little need to elaborate. We are all aware of the great libraries of books and paper on engineering subjects, and of the large volume of new books brought out each year by the great technical publishing houses. In fact the volume is so great that there are now available several index and bibliography services which endeavor to aid the researcher. That part of the requirement dealing with extension by common effort is answered in the work of the journals published by the various engineering societies.

There can be no doubt that the second criterion is met, for the demand for engineering education has had a profound influence upon the development of higher education in general, at least in the United States, and probably throughout the world. From the establishment of West Point to provide officers for the army trained in the necessary engineering skills of modern warfare to the report of the American Society for Engineering Education in 1951 that there were 148 institutions accredited by the Engineer's Council for Professional Development, with 147,694 students enrolled, there has been steady progress in a distinctive engineering education and the vast majority of men engaged in the educational process are themselves qualified engineers.

The third and fourth test of Dr. Wickendon may be considered together. There is no doubt of a standard of qualifications based upon character, training and competency for admission to the professional group. This has been somewhat formalized by the adoption of a code of ethics by most of the members of different branches of the profession. Since most men enter engineering through the engineering colleges, the entrance requirements furnish some measure of screening. The process of attrition during four years of study operates not only on the basis of academic ability, but is hard on cheaters and other unworthy students. This results in the majority of engineering graduates being rather fine young men. During employment as an engineer the young man generally works with other engineers who tend to discard him in the promotion and selection process if he does not meet at least minimum standards of professional behavior. Finally there is the fact that to an increasing degree the operation of law, under the leadership of the National Society of Professional Engineers and in cooperation with State Boards of

Engineering Examiners, is entering the situation to deal with those few individuals who are definitely dishonest in their practices.

The more or less formal recognition of professional status by one's colleagues and the state, is evidenced by admission to one or more of the professional societies of engineers. Recognition by the state has long been a fact. Starting in 1907, when Wyoming adopted the first state law regulating the practice of engineering, the movement has progressed until today every state of the United States, the District of Columbia and all of the United States Possessions have engineering practice laws. Unfortunately, the engineers themselves have been somewhat slow to avail themselves of the advantages which state registration affords. There are still more engineers who are not registered than men who have obtained their certificates. This is a situation which is passing rapidly and within a few decades it will probably be as rare, if not as impossible, to find an unregistered engineer, as it is to find a doctor who does not have his state license.

Engineers as a group were pioneers in recognizing the benefits that can be achieved by group action through professional societies. The oldest such society, the American Society of Civil Engineers celebrated its centennial in Chicago this past year. Probably the youngest, the American Institute of Industrial Engineers, has grown in a little more than five years until it has student chapters in 21 engineering colleges and senior chapters in about 29 cities or regions. Along with the growth of state regulations of engineering practice there has developed the recognition of the need for an organization of engineers simply as engineers without regard to which branch they practice. This has come in the growth of the National Society of Professional Engineers, with its subsidiary organizations of State Societies and City or County Societies. This society deals with problems of legislation, of favorable publicity for the engineering profession as a whole, and cooperates with state boards of registration of engineers.

In addition to the criteria proposed by Dr. Wickendon, two additional ones were offered. The first of these dealt with a group having close contact with other professional groups to obtain their aid in coping with problems which may be described as being on a borderline. No one profession can possibly encompass all of the detailed knowledge necessary to solve the problems of modern living. On this score too, we find that the engineering profession measures up well. The ancient plague of the Black Death was overcome in London a couple of centuries ago by the team work of an engineer who charted the incidence of new cases on a city map and a doctor who concentrated his effort on those areas of highest incidence rates. Incidentally, the greatest gain was made by the engineer improving the water supplies and sanitation after the doctor determined the need for such improvement. A modern example is to be found in the work of the Air Materiel Command which has joint teams of engineers and doctors and psychologists working to make advanced types of aircraft fit places for men to live during operation.

The second point which related to the existence of a sub-professional group cooperating with and assisting the members of a profession may not be quite so obvious. Reflection will reveal, however, that it is a characteristic of the learned professions that they do have such groups of technicians. In the field of medicine there are nurses, laboratory technicians, and physical therapists to name a few. Lawyers have their clerks, reporters, and investigators. Engineers have draftsmen, time study observers, calculators, laboratory technicians, instrument men and experimental mechanics. These groups make is possible for the fully qualified members of the profession to devote their time to the more difficult and exacting portions of the work.

Having thus developed the characteristics of a professional man and his professional group, it is possible to take up the question of what each person as an individual can do to be more professional and how he and his employer will benefit there-from. Of course a quick answer would be to say that he should follow the suggestions already implied in the above discussion. Fortunately it is possible to be more specific.

First of all the engineer should be proud of his profession, he can be ever so humble about his own position in it, and if he likes he can entertain grave doubts about his own worthiness to be a part of it, but there is every reason to be proud of the achievements of engineers as a profession. Think of the fact that Roman engineers had built great roads and aqueducts, and buildings with central heating systems by the time that Justinian codified the laws. Think of the fact that Sir Christopher Wren had designed St. Paul's of London in 1675 before Louis Pasteur discovered bacteria to begin the development of modern medicine. Think of the fact that modern cities and the enormous growth of population in our Western Civilization would have been impossible except for the achievements of the engineering profession. Any group that does not appreciate and acknowledge its debt to its past leaders is not worthy to make further progress.

Next the individual engineer can remember always that engineering, as a professional work, is characterized in the individual by work of high personal responsibility on a distinctly intellectual plane. It is recognized of course that there is much in engineering practice which consists of routine day to day work that is in some cases almost in the category of drudgery. The important thing lies in the mental approach of the individual, if he endeavors at all times to keep before himself the basic scientific principles which underlie the work at hand and to extend his understanding and appreciation beyond routine procedures he will live as a professional person and rise above the tribulations of daily duty, and he may have the great satisfaction of making a real contribution in the form of a better way of accomplishing the routine task itself.

Although man does not live by bread alone, money is important in our society because of the real satisfaction for which it can be bartered. Therefore none should propose that engineers should be content with less than a fair and reasonable monetary return for their efforts. It should be constantly remembered that preparation for a career in engineering requires a long and arduous course and apprenticeship and that the current fee or salary received by an engineer is not only payment for present services, but an installment in recovery of the past investment. Even though all this is kept in mind, there remains the fact that the truly professional engineer is distinguished by a motive of service rather than an exclusive preoccupation with making profits, and that he finds self-expression in his work, the joy of doing a job to the best of his ability, whether a boss is looking or not. If he is asked to design a machine or structure in a way that he knows is dangerous or unsound he will withdraw from the assignment rather than compromise his own standards of honesty, workmanship, and personal integrity. The monetary loss immediately suffered from such action may hurt, but it can be repaired. Prostituting his good name could never be repaired. It requires great courage for a man to say of a given piece of work that it is unprofessional and unworthy and I will have no part of it. This is all the more true because the issues are seldom clear cut and the engineer may not even be able to count on the approbation of others who know something of the facts. However, professional engineering is no place for moral weaklings.

Finally the individual is living as a professional if he is constantly conscious of his debt to his profession; if he realizes that he has made his progress through the help of countless others, mostly unknown to him, and that the only way that he can repay this indebtedness is by helping others in turn. There are three main ways that occur in which this can be done:

1. By helping younger men who may be associated with him, by explaining details and principles of their work, by causing development in them of realization of their professional opportunities and obligations.
2. By aiding in the operation of the engineering societies which are appropriate for his membership, with the idea that returns to him personally may not warrant the effort and expense that he puts in, but that he is aiding others.
3. By writing for engineering journals

(Continued on Page 11)

PREPARING FOR ARBITRATION

By J. Noble Braden

Executive Vice-President, American Arbitration Association

Based on an address to the Annual Convention, American Institute of Industrial Engineers, Cincinnati, Ohio, May 1, 1953.

In speaking to a convention of engineers it must be assumed that in discussing the use of arbitration, the subject should be approached from the engineers' point of view rather than the usual general outline of the use of arbitration in labor-management relations. But the fundamentals are the same.

The object of both management and labor is a better standard of living. But that alone is not enough; both seek happiness or contentment. Many people have been satisfied with only the essentials for life because they were content in what they were doing. They were accomplishing something which gave them satisfaction and recognition or as it has been termed, human dignity.

Engineers have done much to make life easier and bring about greater productivity. But frequently they have failed to take steps necessary to have their plans understood by those affected—with the result that ill will and discord have been created. The strike is the explosive evidence of acrimony caused by such misunderstanding.

Arbitration offers a method to settle the dispute promptly, stop the discord and bring about understanding and good will.

The parties should settle their disputes by negotiation — collective bargaining, but when that cannot be accomplished, arbitration — voluntary arbitration — there is no other kind — stands ready for service.

Labor and management are almost unanimous in their adoption of arbitration for the settlement of disputes arising out of their contracts. The U. S. Department of Labor reported in March that a survey showed that 89% of all agreements include an arbitration clause.

It is hardly necessary to discuss the necessity of adopting an adequate clause —one that will provide against any lapse or failure in the actions of either or both parties—one that will answer the questions of What—How—When—Where and Who?

What is to be arbitrated?
How is the proceeding to be initiated and carried forward?
When is the arbitrator to be appointed?
When must hearings begin?
When shall the award be rendered?
Where shall the hearing be held and where shall the notices and award be sent?
Who will fill the lapses if the parties fail to appoint or agree on arbitrators and remedy other failures to proceed?

An arbitration clause in a contract is like that factor which the engineer adds for safety after all his calculations have been computed.

It is little realized how well unions and management get along together, how few disputes reach arbitration. Strikes make news; peaceful settlement of disputes passes unnoticed. When it is remembered that there are some 90,000 collective bargaining agreements in this country, it is remarkable that so few disputes go to arbitration. Although the American Arbitration Association is named in probably 25,000 or more contracts, only 1400 cases went to arbitration last year and a substantial portion of those were disputes between the same parties.

John Smith complains to his foreman that the work to which he has been assigned warrants his advancement to a higher job classification. A group of employees complain to the shop steward that the new work assignment lowers their take-home pay or makes it exceedingly difficult to make the quota or earn the bonus. A dispute is born and it goes through the three or four steps in the grievance procedure without settlement. Arbitration is demanded.

THE DEMAND AND ANSWER

The first step in preparing for arbitration is not the selection of the arbitrator, but a careful review of the grievance and the terms of the contract in order to be certain that there is a basis for the claim or for opposing it. Having determined that, the demand for arbitration or the answer may be prepared.

The Demand is made of course by the party asserting the claim. It should include notice to the other party of the intention to arbitrate, a statement of the claim made and the remedy sought. If any money is claimed, the amount should be set forth or at least the basis for figuring the amount that may be due. Any provisions of the contract that may have a bearing on the matter should be cited.

The defending party should file an answering statement, setting forth its position and reciting any clause that it believes has a bearing on the question. If the claimant has omitted any relevant data, the defending party has this opportunity to direct attention to it.

The claim and the answer are papers that will guide the arbitrator in his consideration of the evidence as it is produced and also will present the questions he will have to consider and determine in making his decision.

During the hearings, additional information may be produced, but the statements in the demand and answer are the essential guideposts for the arbitrator.

APPOINTMENT OF ARBITRATOR

The appointment of the arbitrator comes next. Lists of arbitrators are available through the Federal Mediation Service, many of the State Mediation Boards and the American Arbitration Association. The American Arbitration Association maintains files of information as to the training and experience of its panel members. It has rules of procedure which will guard against lapses and insure a speedy, orderly completion of the arbitration process.

Under the rules, each party is supplied with a list of possible arbitrators as soon as a copy of the demand has been filed, the arbitrators having been selected after careful consideration of their experience and qualification to decide the issue to be presented. The parties check the list, cross off any person not acceptable, and number the others in the order of preference. By comparing the list and the markings of the parties, an arbitrator approved by both parties is appointed.

When the selection has been made, the date is fixed for the hearing after the convenience of the parties and the arbitrator has been ascertained.

While this is in progress, each party will or should be busy preparing his case.

PREPARATION FOR THE HEARING

Under a collective bargaining agreement, the facts regarding the grievance will be known by the parties through the course of the grievance procedure. The arbitrator, however, will know nothing whatever of what has previously transpired, and it is essential, therefore, that a case be prepared carefully and completely. The following is a suggested course of preparation:

1—Study the statement of the grievance.
2—Review the contract thoroughly and note carefully all clauses that apply to the grievance.
3—Examine all records that have any bearing on the grievance.
4—Interview all witnesses.
5—Take down summaries, at least of their statements, in order that you may know what testimony you have to offer and how it will cover the essential facts.
6—Secure copies of any documents or papers (other contracts, etc.) that the arbitrator should receive. ("Photostats" are most convenient.) If these are in the possession of the other party, notify him that they will be required at the hearing.
7—The arbitrator is usually empowered to issue a subpoena for persons or documents at the request of a party.
8—When you have prepared an outline of your case, discuss it with other officials of your organization, in order that you may have other viewpoints on the matter.
9—Endeavor to prepare an outline of your opponent's case so that you may anticipate what proof he will offer and how you may examine it and answer it.

In preparing the case for arbitration, it is frequently desirable to obtain information as to conditions and practices in competitive plants or the industry generally, and to secure publications or other documents which may support any statement made in regard to such information.

In planning to offer documents and

data, parties should be prepared to have them substantiated and identified by witnesses, if required.

When an engineering question is the issue, the engineer should be ready and able to supply the original data upon which the conclusions were based.

I recall a number of cases where the final report fixing a work assignment was offered, but when the arbitrator, a distinguished Dean or Professor of Engineering, asked for the data upon which it was based, it was refused. The engineer appeared to believe that his professional integrity or qualification was being questioned.

It must be remembered that an arbitrator is guided by the oath of his office even when it has been waived by the parties to "hear and **examine** the matters in controversy and render a just award." He can only do that in good conscience when he has full information.

In the cases I have in mind, because of the refusal to supply the date, the arbitrator required new time studies to be made by a technician of his own selection, thus adding to the expense of the proceeding and delaying the determination of the grievance.

May I suggest that there are no secrets in labor-management relations. Both sides are generally well-informed regarding each other's activities.

Arbitration is a judicial process. The dispute is being tried before a judge who must be convinced arbitration, unlike negotiation and mediation, is not a process of horse trading and compromise. It is a determination of the dispute, not an adjustment of the claim. An arbitrator should not attempt to mediate and settle the differences. There are cases where the parties, having to produce all their facts and carefully listen to each other and judge the effect of the evidence on the impartial outsider, develop a new understanding of the other's point of view. In these exceptional cases the parties may request the arbitrator to try and adjust the matter, but if he is invited to mediate, remember that he will probably, and in most cases, be unable to resume his role of arbitrator if the mediation fails.

THE AWARD

The decision of the arbitrator is final and enforcable unless it can be proved that he has been guilty of misconduct, bias, exceeded his authority, failed to dispose of all the issues presented in the demand and answer, or if he has committed fraud.

Award may be entered as judgment in the appropriate court and will then be enforced by court action. The sheriff may collect money due or the court may direct specific performance.

Recently the U. S. Circuit Court of Appeals in Ohio issued an injunction under the Taft-Hartley Law requiring an employer to perform the award of an arbitrator. The Law had previously been invoked by another union in South Carolina and there the U. S. District Court had issued a similar decree. Awards are also enforcable under many state statutes and under common law.

CURRENT PROBLEMS

There are a number of problems that are the subject of discussion among users of arbitration. Among the most widely considered are—

The scope and function of the arbitrator.
The type of arbitrator or board to be used, particularly whether to use a permanent arbitrator, a tripartite board, an impartial chairman.
The cost of arbitration, including the fees to be paid arbitrators, the necessity of a stenographic record, the use of lawyers.
Should arbitrators write opinions?
Should awards be used as precedents?
Should questions as to whether the grievance comes within the scope of the arbitration clause be determined by the arbitrators or taken to the courts?

Time does not permit a full discussion of these problems but may I comment on them briefly?

Arbitration is a process established by law and over hundreds of years its scope and functions have been defined by the courts. It is the voluntary reference of a dispute by the interested parties to a disinterested person for determination, not for mediation.

The type of arbitrator, permanent or "ad hoc," depends entirely on the wishes of the parties; both have advantages and disadvantages and the maturity of their collective bargaining relationship. The impartial chairman was created by the garment industry where he was a type of policeman to enforce the observance of the contract, particularly by all members of the management group.

The tripartite board, where a third member must secure the acquiescence of one of the partisan representatives leads to compromise and delay. It is generally unsatisfactory. If one is desired because of the complexities of a business then give the impartial member the right to make the decision.

The cost of arbitration is within the control of the parties. They should know in advance the rate of the fee of the arbitrator, and when desirable, limit the time he is to be allowed for the making of the Award. Stenographic records are unnecessary in many cases and frequently delay the making of the decision. A delay may dim the recollection of the arbitrators' impression of the witnesses and result in his being influenced too much by the skilled statements made in the brief which usually follows a stenographic record.

The majority of parties prefer the arbitrator to write an opinion so they may have the reasoning he used in deciding the issue. Many, however, believe that opinions may influence the next negotiation. Opinions add to the cost. One well known and long experienced arbitrator discontinued writing opinions several years ago unless requested to do so after his award was delivered and then only when paid extra for the opinion. He has had no such requests.

In an integrated industry or in a single company, awards will serve to guide future action but awards generally should not be used as precedents. We have no uniform or common law of labor relations. Custom and policy differ from industry to industry and company to company. Without a full knowledge of policy how can one use an award rendered in another field?

When any question arises as to whether a grievance is within the scope of the arbitration clause, is it not better to have it determined promptly rather than taken to court in a drawn out legal battle leaving the grievance to grow and engender acrimony and discord and break down the good will that good labor relations should promote?

My subject was arbitration preparation and I may have covered more ground than your program chairman intended but I believe all that I have presented is of concern to any who have the duty to prepare for arbitration.

I cannot close, and probably should not, without some reference to the engineers place in arbitration. There are three fields open to him. One, to serve his client by preparing carefully and thoroughly the data necessary to establish its claim or contention. Second, to serve as an impartial expert appointed by an arbitrator or selected by agreement of both parties to make a study and prepare a fact finding report. And third, to serve as an impartial arbitrator where his training, knowledge and experience will enable him to judge the dispute and render a just award.

In closing may I suggest to you that labor and management have given us a great demonstration of the American way of doing things. The American way that enabled us to give the vote to every man whether he owned property or not, to give the opportunity to the poor boy of today to become the leading industrialist or leading statesman of tomorrow.

It is only a dozen or so years ago that the right of employees to bargain together for better working conditions was established as a national policy. But in those few years we have accepted collective bargaining and today there are probably 100,000 such agreements in force. And even more significant is the fact which I called attention to before—almost 90% of them include provision for the use of arbitrators for the prompt settlement of disputes. An outstanding evidence of the burial of economic warfare as to the performance of contracts. An outstanding evidence of mutual respect and cooperation. The creation of a will to peace.

The use of the arbitration clause is growing not only in collective bargaining contracts, but in domestic and foreign trade agreements also. In 1952 the American Arbitration Association administered arbitration in which the nationals of 48 foreign countries outside the "iron curtain" were parties.

The will to peace is growing; our use of the arbitration process is setting a pattern for the way to world peace. The American way is going forward and God willing, it will prevail.

Gaining Worker Acceptance of Incentives

By Leonard R. Sayles

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Based on an address to the Annual Convention, American Institute of Industrial Engineers, Cincinnati, Ohio, April 30, 1953

The functions of the industrial engineer are central to the most significant and complex problems in the field of personnel and industrial relations. In developing standards, rates, and wages, the industrial engineer must be willing to deal with all the subtleties and intricacies of the social system of the factory. Everything he does has a profound impact on the relationships of people within the plant: on workers to staff and line management representatives, on workers' relations with other workers and their relations with the local union. If his work is to be successful, he cannot afford to neglect any of these, for "selling" incentives, job evaluation, and any other systematic, scientific, and presumably **impersonal** method of earnings determination requires unceasing attention to the personal factors in the situation.

What I will be discussing is not based on any extensive knowledge of the technical systems you have developed. On the contrary, you will probably find me woefully uninformed on many of the developments in your specific field. I intend to limit my observations, and in turn, for that reason, you will find them limited, to some of the human relations implications of industrial engineering I have observed in several years of field research in industrial plants. Most of my work has involved interviewing and observation of workers, that is, rank and file employees, and therefore most of what I say will relate to their attitudes and points of view. It is hardly original to observe that successful application of industrial engineering methods, or any personnel program, requires a full appreciation of the reception given to these by the workers themselves, and it is their attitudes which, in large measure, determine their success or failure.

In gaining acceptance for incentives, the industrial engineer has one major factor in his favor, and that is the willingness of American workers to accept and cooperate with payment systems tied in with productivity. That conflict ensues over specific applications must mean that some important area has been neglected.

Most specialists in the field have come to agree on three criteria for successful incentive administration.

First, and most obvious, is that the plan provide **earnings commensurate with worker expectations.** Our workers are as keen at assessing the relative effort required by various levels of output as any engineer. When through faulty rate setting or technical impediments, a particular plan does not "pay off," no matter how few the number affected or how short the time period, incentives in that particular plant have been given a black eye.

While this is the most obvious criteria of "worker expectations" that needs to be met, there are others, less obvious but equally important. If incentives serve to alter drastically the earning power of various groups within the factory, **expectations** are frustrated. Not just a "tight rate" but also a "loose rate" can create havoc in the social system of the factory. Some work group that is thought of as holding jobs lowly ranked, suddenly bursts forth with earnings in excess of more skilled and senior workers. The pressure is felt all the way down the line, from union officers to foremen.

Day workers, those not involved with production bonuses, are most susceptible to inequalities. Usually, even if not in some measurable fashion, the efforts of these groups are related to the output of the incentive workers. Yet if they are not compensated for their contribution to incentive production, and worse, their relative earnings in the plant suffer because of bonuses earned by pieceworkers, serious dissatisfactions result.

All of these, through pressures on the union, mean rough sledding for future incentive plans, adjustments in rates and day-to-day administration. Union leaders who accept incentives cannot be expected to continue to look with favor on systems which pit group against group and produce insoluble grievances that injure the reputation of the union. Thus the industrial engineer has the responsibility of achieving that delicate balance, a plan that provides additional earnings commensurate with additional effort, and earnings commensurate with the skill and the rank of the group involved.

The second criteria is just as difficult to meet. It is perhaps the most controversial in this field, and that is, that there be no "rate cutting." Apparently nothing is more conductive to restriction of output and related phenomena; all completely antipathetic to the principles of incentives, than the knowledge that high productivity means you get your rate cut!

But the engineer asks: What do you do about a job on which there has been faulty rate setting or a technological improvement which makes the standards meaningless?

Let us deal with the first part of the question initially, and to add the complications of reality point out that this "loose rate" is throwing earnings out-of-line for the whole plant. To protect the relative evaluations of jobs in the plant and correct an obviously inappropriate rate, is it not acceptable practice to restudy the job? The answer is not simple because there is often not general agreement that the rate is very obviously "out-of-line." And even if the men on the job recognize that effort alone could not have produced their current high level of earnings, men in other departments draw the conclusion that producing all you can is an efficient manner of cutting your rate, or in their vernacular, "Cutting your own throat."

The same problem emerges with management-introduced improvements on the job. When does a change become a substantial change so as to warrant a new rate? What do you do when the worker himself is successful in improving the job?

I cannot provide fixed answers to these questions. I can only suggest that upon their equitable solution—in the eyes of those working under incentives — rests the future of incentive programs in that particular plant. More tact, patience, and understanding is required in this area than almost any other. The engineer must be willing to sit down with the parties and spend literally full time working through the adjustment, and certainly the union's role will be crucial. Only a very secure and accepted union organization can conceivably take responsibility for assisting in the process of cutting a rate, once it has been established.

The final criteria is also neither original nor startling. I am sure you have heard many times the admonition: MAKE IT UNDERSTANDABLE. Perhaps the only startling aspect of this is that one still finds incentive rates that are totally incomprehensive to the laymen, I might add, laymen in both academic and factory circles. I regret to say that the average worker is suspicious, but suspicion is a natural element in any hierarchical social structure, and a factory with its superiors and subordinates will always contain suspicion.

Unless the worker is able to compute for himself **his earnings**, as he earns them (and I don't mean the ability to sit down with a computer on the weekend and run through a series of equations in an hour or so), unless he can know, let's say, every hour, what he has earned and be in a position to check this knowledge with his weekly pay, then incentives for him are a lot less meaningful and significant than they should be. Further, he will always be in the position of doubting the accuracy of the accounting department totals.

We know from many studies in human relations in industry, that workers like to pace themselves; they like the flexibility of varying their own output. In most instances, an incentive plan provides them the freedom to do this much more than the average day work operation. The worker to intelligently (now from **his** point of view) vary his pace, wants to be able to compute the dollars and cents ramifications of his on-the-job decisions. In other words, he wants some of the feeling of being in small measure

an independent contractor, deciding how much of his labor to give for a known return.

Summarizing these criteria of incentive application, I would say that by far the most neglected is the realization that the plant has a dynamic structure. Here work groups, not individuals, are the important variable. These groups are constantly comparing the benefits they obtain from working in X plant in relation to the discomforts they endure, with similar returns of other work groups. One of the most obvious means of comparison are incentive earnings. And so you have groups under various plans and rates comparing the looseness and tightness and in turn comparing themselves and being compared by non-incentive workers in the plant. And believe me when I say that these comparisons are sensitive to very slight variations. Whenever an incentive rate upsets a customary differential between groups, perhaps one based on a long standing plant tradition, you can expect serious trouble in one form or another.

Thus, selling incentives to workers and their unions is definitely not a matter of salesmanship techniques. The industrial engineer needs to understand the social system of the factory if he hopes to gain acceptance, because the work he does intimately affects the most crucial areas in labor relations.

For incentive plans to be successful, they need to fulfill worker expectations: that earnings will be commensurate with effort, that skill and experience will continue to receive recognition as well as high output, and that the individual will himself be able to regulate his output in terms of a full understanding of the mechanics of the bonus system.

One concluding note. It would be apparent that the industrial engineer and his activities are often not the cause of personnel difficulties. On the contrary, their efforts can often help to provide solutions to otherwise difficult situations. However, primarily because their work so intimately involves the life stream of the plant from the point of view of the worker, namely earnings in relation to effort, they can easily become whipping boys for other instabilities. What is easier to attack than a rate? While many problems have a yes and no answer, or so it seems to the parties in dispute, rates in both job evaluation and incentives are continuously variable. A little leeway here or a slight concession there is all that is asked, and because the stopping or breaking points can never be exactly defined by formula, rates become the most easily arguable dimensions in labor-management relations. It is this susceptibility to pulling and hauling that must be realistically recognized by the industrial engineer. Efforts on his part to make a specific rate inviolable will nearly always be doomed to failure. It is this conflict between the temptation to assert scientific precision and a recognition of the realities of the situation which will always plague the industrial engineer.

THE ENGINEER AS A PROFESSIONAL MAN

(Continued from Page 7)

and other publications. This is said with the thought that a profession is the sharing of new developments and the constant growth of a body of professional literature.

How is the individual engineer to benefit from the practice of these individual efforts toward true professionalism? The gains in personal satisfaction and pride of achievement have already been discussed. For the person who wishes to be extremely practical and temper his idealism with a reasonable amount of materialistic thinking, it can be confidently stated that there will be monetary rewards also. The ratio of costs for the engineering which goes into any given project to the costs for materials, labor and other services is generally so low that engineers could receive greater returns without materially increasing overall expenditures. In fact in a great many instances more professional engineering services can be bought in a given situation without any change in the overall cost of the work unless it is a downward revision. This is to say that in a general way there is enough wastage of materials, labor and other factors from poor or no engineering, to more than pay for the best possible engineering and leave desirable margins of savings. In the field of industrial engineering this is especially true since there are manufacturing and other enterprises whose managers believe they cannot afford industrial engineering services, when, if the truth were known, they actually cannot afford to do without them.

The very fact that some of the most active and hard working men in the professional societies, engineering and others, are men who have attained financial independence is proof that the approbation of one's peers is one of the sweetest rewards that any person can win. Some doctors continue to practice long after they have enough money to spend all of their time fishing, some industrial managers continue to work when they might live longer and have life easier if they would sell out and retire. So, truly professional engineers continue to practice and to devote an increasing portion of their time to the development of their profession after they too have reached a point where the remainder of their lives could be one long fishing trip.

How will it benefit employers for engineers to behave as more truly professional men? At first glance it might appear to only have the effect of raising the cost in purchasing engineering services. This may to some extent be true, but there is scarcely a successful employer who does not make his purchases on the basis of performance and will always purchase a higher priced material if the final cost is less. There are of course two classes of employers to be considered. One is the commission or board which hires, or engages the services of an engineering consultant from time to time to design and supervise the erection of a dam, a bridge or some other important engineering project. In this case there is usually no question about engaging the best, the best professional practitioner, because it is obvious that any design other than the best for the situation at hand is likely to be costly in the end. The other class of employers are manufacturers, railroads, governmental agencies or any others who use engineers as regular employees. It is this group which is most likely to become confused between their engineers and any other employees, and to seek to employ engineers on the basis of the lowest payroll cost possible. It is this group which often tends to create confusion among engineers by taking some individual who can do some of the things which engineers ordinarily do and assigning him to an engineering title.

To generally progressive and alert employers who may merely be unaware of the advantages to them of having truly professional engineers, the following benefits are cited. Every employer desires employees who are motivated beyond the paycheck, men and women with high morale, with satisfactions in a job well done, that is the individual who desires to live by professional tenets. The enlightened employers realize that the engineer who spends his working life in the business is bringing that business into contact with the body of knowledge that is the engineering profession. It is evident then that the more that the individual engineer allies himself with and makes himself a part of the general professions of engineering, the more the employers will benefit.

It is true, of course, that there may be times when a professional engineer employee may disagree with his employer, but the enlightened employer will recognize that such disagreement is based upon sincere convictions. Better employers will understand that the professional engineer really has the ultimate best interest of his employer at heart, and that all the employer can do to promote professional achievement and attitudes on the part of his engineer employees will finally result in benefits to the company that cannot be measured in terms of immediate expediency. Thus the rewards to the individual engineer, to the employer and to society of engineers, individually and collectively, living and growing as professional men in a great profession is incalculable.

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[1] This paper is based on an address to the Birmingham Chapter of the American Institute of Industrial Engineers, October 13, 1952.

[2] The term profession refers to what are sometimes called the learned professions. These are understood, by most informed people, to include engineering, law, medicine and the ministry. Efforts of certain trades to raise the prestige of their group by adopting the term will be dismissed as being unworthy of further notice. Such dismissal includes, for example, the barbers who decided to be known henceforth as 'chirotonsors' in order to raise the public esteem of their 'profession.'

Negotiating Incentive Systems

By Paul W. Deubery

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Based on an address to the Annual Convention, American Institute of Industrial Engineers, Cincinnati, Ohio, May 1, 1953

Many phases of industrial engineering directly and indirectly affect the employee relations of a company. Thus it is vitally important that industrial relations men and industrial engineering people work closely in their various activities which affect employees, in order to insure a company of a well-stabilized employee relations program.

The personnel of these two departments must cooperate with each other and have a thorough understanding of each others' problems and objectives. Too often a company's employee relations and labor relations suffer because of a lack of this necessary cooperation. Too many labor negotiators attempt to negotiate contracts without the able assistance of specialists in other phases of the business. They are unaware of the pitfalls that only an expert on that phase of the business could point out and avoid.

The labor negotiator should include on his team production, accounting, and engineering personnel. Whether they take an active part in negotiations or act in an advisory capacity depends a great deal on the individual, but their presence is essential, not only to assist the negotiator, but also to sell themselves and their philosophies to the union.

In addition, they are able to see first hand how contracts are negotiated and why it was necessary to make certain concessions to the union.

Whenever an incentive system is being negotiated, either during the initial negotiation of the system or during renegotiations, there are certain fundamentals and basic principles which must constantly be kept in mind by representatives of management. These principles must be clearly established in advance of negotiations by industrial relations, industrial engineering and operating personnel.

Assuming that a wage incentive system is being initially negotiated into a union contract, I will attempt to develop what I consider the points which must be included in a contract to afford management protection and to insure and maintain the objectives of an incentive system.

In establishing principles which management wishes incorporated into a contract, we must remember the basic objective of an incentive system is to decrease unit cost, while at the same time retain employee acceptance by providing a fair opportunity to increase earnings through added effort. This factor of employee acceptance is fundamental. Company negotiators who attempt to negotiate an incentive system that does not provide this opportunity for increased earnings through added effort completely destroy the purpose of the plan.

Let us consider the principles of an incentive plan, which should be set forth in clear and concise language in a contract. They should be acceptable to the employees, and at the same time they should insure the company the protection it needs in the operation of the plant.

First, the plan must be established on a fair and equitable base rate, comparable to the area and or the industry. These base rates should represent 100% efficiency of the operator, and the operator should be paid incentive earnings consistent with the percentage of incentive effort worked above this base rate, or 100% efficiency, level. Two things are important in setting forth this principle in a contract: (1) That the definition of a normal operator is established; and (2) that the normal operator must work at a 100% efficiency to equal his base rate and that incentive earnings be paid for efficiency in excess of 100%.

Some companies establish incentive systems on low base rates and guarantee employees a certain percentage of earnings above these base rates. The big argument in favor of this practice is that incentive earnings computed on an incentive basis on a low base rate will be less than incentives computed on a high base rate. This is true, but I feel that companies are only fooling themselves when they establish low base rates and then guarantee incentive earnings on top of these base rates.

A good incentive system is based on the principle that employees will be paid increased earnings for increased productivity. I feel that the clean way to handle this is to set forth clearly a fair base rate, establish the principle that 100% efficiency is equal to this base rate, and pay employees incentive earnings for effort in excess of 100%, with no provisions guaranteeing that an employee will earn 10%, 15%, 20% or 30% incentives.

My second point is one that most unions insist on being in a contract, and one that I heartily agree should be. The data included in the timestudy write-up and study of the job should be set forth in detail. This should include a breakdown of the elements of the operation, sequence of performance, complete description of the tooling and equipment, sketch of the work place layout, as well as method and motion pattern to be followed in the performance of the operation. The timestudy should also show the total elapsed period of time in which the timestudy took place, the number of pieces produced, as well as the leveling factor.

It is essential to have a timestudy man firmly establish proper methods and job breakdown before commencing the study. If this is done, the timestudy man should have no fear of including in his data the points mentioned above.

Too many times methods are established and rates taken, and later changed, because of short-cuts introduced by employees. This always causes suspicion, and the company is constantly being charged with attempting to capture employee efficiency. When the detailed breakdown of the method and all the factors which are included in the taking of the timestudy appear on the timestudy sheet, there can be very little argument about what took place when the study was made, in the event of a dispute later on.

The next point I want to cover is probably the most important point in the entire contract. It is the matter of leveling. It is important here that the contract language specify that the average cycle time or average element time of the job be a percentage increase or decrease, based upon the efficiency of the operator as determined by the timestudy observer.

It is also well to point out in the contract that in the event the operator's efficiency is too far below or above normal, the timestudy will not be used, because the greater the percentage of variation from normal that exists in the operator, the more difficult it is to level. In most of our contracts we state that if the efficiency rating of the employee is lower than 85%, the study will not be used.

I would like to point out here that in connection with this leveling factor in the contract, it is important in the successful operation of any incentive system that the timestudy men be given group training in leveling to eliminate tight and loose rates.

The more consistent the timestudy man in the plant levels, the more uniform will be the rates. The real danger of letting loose rates creep into a plant is that these rates become the basis for other rates, and employees constantly compare newly-established rates with present loose rates.

We now come to the part of the contract which provides for allowances. The contract should clearly set forth the allowances which will be included in the incentive standards. It is well to have these allowances broken down into a percentage for personal and fatigue time, and a percentage for contingencies and delays. Usually we attempt to provide 10% allowances for personal and fatigue and 5% for contingencies and delays in all studies. It is also advisable to set

forth the equivalent of these percentages in minutes per hour.

For instance, we designate that 15% allowances equal a 52.2 minute hour, and that the 15% should apply against the leveled element time. If this is not carefully spelled out in the contract, a claim may be made that 15% of 60 minutes is 9 minutes and therefore 9 minutes out of every hour should be allowed for personal relief and contingencies and delays, whereas the actual 15% equals 7.8 minutes.

This is a good illustration of how a negotiator for management, not familiar with timestudy, could leave himself wide open if he did not work closely with the industrial engineering department in negotiating incentives.

Extreme care must be exercised that there is no language in the contract that permits negotiations during the contract year or additional allowances for some types of operations.

The contract should provide for an allowance for contingencies and delays, which is considered an average for all types of operations in the shop, admitting that in some cases the allowance would be in excess of actual time while in other cases it may not be sufficient.

Another allowance factor which usually enters into negotiations is that of allowances for machine element time.

I feel that some consideration must be given to provide incentive earnings during the machine cycle time, but not to an extreme extent; and only when the machine element time is a maximum percentage of the total cycle time of the job. For instance, we attempt to negotiate into our contracts a percentage allowance factor for the machine element time when the total machine element time exceeds 50% of the total cycle time.

It is important that the contract wordage permit the company to make timestudies and place these timestudies into effect without union participation. The new rate changes released by the timestudy department should have a trial period to run, during which time employees may protest the standard by filing a grievance. The company during this same period of time reserves the right to restudy and revise the operation if it believes that it has been incorrectly established.

This trial period run cannot be a one-way street in which employees may protest but the company has no right to make changes. Following this trial period, if no protest is filed, the standard should become permanent. It should not be changed unless changes in method, material, schedules, tools, design or style of the product occur.

In connection with the releasing of new rates, the contract should provide that any guarantee is removed, and the operator is paid the new incentive rate only. If the guarantee continues, the operator has no incentive to make the new rate. I have seen many cases where an operator or group of employees will "lay down" on a new rate and file a grievance in protest. Later, knowing the rate was satisfactory, they decided to go to work because the company refused to change the rate and the loss of earnings began to hurt.

It is important to include in the contract exactly under what conditions a change in standard or restudy can be made. Changes of material, tools or schedules can in a great many cases affect the standard. If these conditions are not carefully spelled out, protests may be made regarding changes of rates because of changing conditions. This is particularly true when a change tends to tighten a loose rate.

When we have continuous operations included in an incentive plan, it is also important for the company to retain the right to establish new standards in the event of change of schedule.

We now come to the part of our contract which can cause considerable difficulty in negotiations. These are the sections which set forth the earnings of an employee for "down time," for incentive pay when scrap and spoilage are involved, and incentive earnings during the period of operation is being timestudied. All of these items should be clearly set forth in the contract.

I don't think there is any argument that when scrap and spoilage are beyond the employee's control, he should receive his incentive earnings. However, when scrap and spoilage are within the employee's control, he should not be paid for the scrap work.

What the employee receives while jobs are being timestudied, and for "down time," I believe, varies considerably from base rate to earned rate. It is advantageous, if possible, to arrive at some figure, or percentage, less than the employee's average earnings to cover "down time" and time spent while the study is being made. If it is possible to pay a lesser percentage, it is an incentive for the employee to get back on incentive work. When earned rate, or average earned rate, is paid, the employee lacks this incentive and productivity suffers.

In addition, I would like to point out some of the other factors that should be included in any incentive contract. Among these are the company's right to decide whether or not to install group or individual incentives and the size of the group in the event of a group incentive plan. Also, the company must retain the right to convert relief and personal time into manpower.

I am referring to relief operators on continuous assembly lines. If this right is not spelled out in a contract, you may find that the entire group will decide to take their relief and personal time at the same time, which means shutting down the line periodically. We have had cases where an entire group demanded to take their relief time every hour. Wordage giving the company the right to convert relief and personal time into manpower solves this problem. Relief operators can be provided on continuous line operations to furnish the necessary relief equivalent to that set forth in the contract.

Another important point which must be covered in the contract is the basis on which incentives will be computed; that is, daily, weekly, or by the job. Our various incentive contracts cover all three methods, but I feel that probably the best method of computation is on a daily basis. The weekly method covers too long a period of incentive earnings, and can inadventently hurt the earnings of an employee.

On the other hand, if the job method is used, an employee may run his earnings on a job he likes up quite high. Later on in the day, if he is on a job he dislikes, or he feels the rate is tight, he may work at less than a 100% effort and it will not affect the earnings on the other job. Employees, of course, like the job method, but I feel that by computing incentives over a daily period it is fair to both the employee and the company.

Negotiating a contract is not entirely the answer to a successful incentive program. Attitudes of management representatives toward the operation of the plan, and fairness in administration, are all-important factors. Supervisors must be carefully schooled in handling grievances with the employees and the union, and in answering employees' questions as they arise.

There should be no mystery in the particular incentive system in effect. Care should be taken that the employees know the system, the incentive rates for the various operations they work on, and how to compute their own incentive earnings.

These are some—but by no means all—of the factors that must be considered in establishing an incentive system. As all of these factors are influenced by many different and varying situations at individual plants, my remarks have necessarily been general.

Again I want to emphasize one point: it is vitally necessary for complete cooperation and confidence to exist between supervision, timestudy and industrial relations personnel. No one of these groups can function independently of the other under an incentive system and have a successful incentive program as well as a good employee relations program.

DON'T FORGET —

The Annual Convention

May 6, 7 & 8, 1954

in

Louisville

MEDIATION & CONCILIATION

By Walter A. Maggiolo

General Counsel and Assistant to Director, Federal Mediation and Conciliation Service

Based on an address to the Annual Convention, American Institute of Industrial Engineers, Cincinnati, Ohio, April 30, 1953

I am delighted to have this opportunity to discuss with you the role of mediation in labor-management relations.

To properly evaluate it, we must cast it in a much broader setting. It should be first assessed in the light of some of the basic concepts upon which our democratic society has been founded.

Our society is fundamentally a meeting of minds civilization. Our whole way of life is predicated on the assumption that while the individual members of our society may have a varying economic, political and social backgrounds and consequent viewpoints, when occasion demands, they can subordinate their self interest to the common good. These individuals, starting from apparently widely divergent positions can by reasoning, utilization of the normal avenues of communication, discussion, recognition of the dignity of human ideas and the judicious use of constructive compromise arrive at "a meeting o minds" and go down the road together toward a common objective. Conflict is supplanted by cooperation.

In either parent or satellite communistic totalitarian societies there is not nor can there be a meeting of minds. In such countries, the entire theory of their government is based on the assumption that there are two classes — capital and labor — whose differences cannot be reconciled. One must impose its will on the other — not by compromise and cooperation but by economic or physical conflict.

Our society is further predicated on the principle of voluntarism as opposed to compulsion. Voluntary reconciliation of differences encouraged but not compelled by the governing power is the universal accepted goal of every democratic society.

Another basic concept to which I would like to draw your attention is that of responsibility. Certain duties and rights flow out of the social relationship. The heaviest burden of carrying out the purpose of the society properly is upon the individual members of the group rather than the governing power. To the extent that the individuals voluntarily assume and exercise their responsibilities as citizens to resolve their own political and social differences;—to that extent a democracy shall be strengthened and flourish.

Further, there is an interrelationship between all group economic actions and the common welfare. This relationship is effectuated in our democratic society through a recognition that private economic rights may not be used to override the paramount public interest.

In keeping with these basic principles, we have evolved our national policy by defining relative responsibilities for the maintenance of industrial peace.

Our policy is not new—its roots may be found in the Labor Board of World War I, in the 1918 recommendations of the War Labor Conference Board, and in Section 7a of the N.I.R.A. It is implicit in the spirit and letter of the Wagner Act and the Labor-Management Relations Act, 1947. Congress, in the Defense Production Act, has reaffirmed and reemphasized it.

Section 502 of the Defense Production Act states:

"The National policy shall be to place primary reliance upon the parties to any labor dispute to make every effort through negotiations and collective bargaining and the full use of mediation and conciliation to effect a settlement in the national interest."

Essentially, it charges both labor and management with the primary responsibility of making collective bargaining work and through the acceptance of this responsibility to seek amicable solutions to their labor disputes. The Government in turn has the responsibility to assist the parties in their efforts to resolve their disputes by making available to them full and adequate facilities for conciliation and mediation. It is not the responsibility nor the proper function of this Government or any Government, **except, of course, in periods of total emergencies,** to dictate to the parties the terms of their wage contract. This is as it should be. A basic tenet of a free society is that subsidiary groups within it should not compel government to undertake functions which they themselves can perform.

A free industrial society demands that the members of that society have full freedom of contract, provided that freedom is exercised consonant with the paramount public interest. The collective bargaining contract should be the result of earnest and intelligent efforts of both parties to the agreement. It should be their own contract—to govern their own relationships—for the stated term.

A wage contract imposed by government fiat is as repugnant to our moral and legal principles as a unilateral dictation of the terms of the contract by either labor or management. I need only to recall to your minds the experience of the '20's, the middle '30's, and of World War II to prove my assertion.

During the period when the Wage Stabilization Board exercised dispute functions, I was somewhat alarmed at the position taken by both labor and management in a number of disputes in which our Service had been interested. In some of these, management, and in others—labor, took the position that their dispute should be settled by the Board rather than through their own efforts. I wonder if these people were aware of the shortsightedness of their attitude. In my opinion they were deliberately shirking their responsibility not only to their own companies and unions, but also to the people of the United States.

Each of the freedoms which we enjoy today in this democracy are liberties which should be safeguarded and cherished. Many have made supreme sacrifices to preserve them. No one of us has the right to freely surrender them. If history has taught any lessons, it has demonstrated that every liberty surrendered to the governing power is difficult to recapture. The liberty of negotiating our own wage contracts through collective bargaining is no less an important freedom than the others we strive to retain.

I refuse to accept the premise that both labor and management lack the leadership and ability to work out their own solutions to their labor disputes and require the Government to dictate it for them.

However, as I stated previously, our Government does have the responsibility of providing parties to a labor dispute adequate mediation and conciliation facilities to assist them in arriving at an agreement. The fulfillment of this responsibility has been delegated to the Federal Mediation and Conciliation Service. The chief function of the service is to provide trained and experienced mediators to assist parties to resolve their labor disputes.

The place of mediation in the collective bargaining relationships is now well recognized. I believe it can be safely stated that few, if any, quarrel with the thought that the resolution of disputes through collective bargaining and mediation is the most desirable approach to a lasting industrial peace.

Since increasing emphasis has been and apparently will continue to be placed on the mediation process, a brief analysis of this dispute settling technique may prove helpful.

Generally speaking, mediation or conciliation of a labor dispute has been described as the intervention of an impartial third person in a dispute for the purpose of assisting the parties to voluntarily resolve their differences.

There is a distinction between conciliation and mediation. Conciliation in its true sense implies the more passive and informal process of bringing disputants together for a discussion of their problems. It is closely related to the extension of "good offices." Mediation is the more active and aggressive process. A mediator not only acts as chairman

of the meeting and the go-between but when occasion demands also puts forward suggestions and recommendations for developing areas of possible agreement on the issues involved in the dispute.

For all practical purposes the two words are used interchangeably. Both Federal and State mediation statutes often in the same context use the two terms interchangeably. In actual practice, the professional mediator when handling a dispute case frequently alternates between the role of a conciliator and that of a mediator. When the discussions are following fruitful paths he may well adopt the role of benign chairman—if discussions encounter an apparent roadblock or appear to wander into dead-end lanes, he will resume his role as mediator and by adroit questioning and suggestions either indicate the bypass or point out the true road.

The mediation process assumes the validity and force of the basic concepts I have outlined before—namely—a meeting of minds civilization—voluntarism—the reposing of responsibility upon subsidiary groups and the principle of the supremacy of the public interest. In a word, the professional mediator facilitates the meeting of minds process and by voluntary means and methods reemphasizes the prime responsibility of the disputant parties to seek their own solution compatible with the public interest.

Most labor disputes present a variety of problems which increase in their complexity in direct relationship to the real or assumed economic strength of each party. Attitudes, economic drives and patterns, emotions, human relations problems, intra-company and union politics, public relations, premature rigidity of positions, personalities—all become enmeshed in the dispute. All too often these obscure the fundamental issues which gave rise to the disagreement.

This is not the uncommon picture which often confronts one of our mediators when he is called upon to intervene in a dispute. He must approach the task before him objectively, calmly and sympathetically.

An immediate prerequisite to his success is the mutual desire of the parties involved to reach agreement. Absent such a desire no mediator on this earth can assist them. Our experience with North Korea and Czechoslovakia are excellent proof of this statement. The failure of our diplomatic efforts to establish a workable relationship is in my judgment directly ascribable to the absence of any desire to settle on the part of these captive nations. If, on the other hand, such desire exists, no matter how latent it may be, then the professional, experienced mediator by applying recognized techniques can accentuate such desire and give it purpose and direction which must inevitably eventuate in agreement.

The mere intervention of a mediator in a labor dispute of itself often expedites the agreement making process. He is a neutral representing the underlying broad public interest. Both parties seek to impress him on the validity of their position cognizant that their explanations must be stripped of its propagandistic trappings. Their appeal to him must at the very least appear logical rather than emotional. Explanation under such circumstances often creates doubts in the minds of the opposing parties as to the position they have assumed.

Several authorities in the field of arbitration and mediation have recently discussed the problem of when a mediator should intervene in a dispute. Some of these have urged that the mediator should be invited to sit in with the parties in the early stages of the negotiations even before an impasse is reached. They claim that this would enable the mediator to become thoroughly acquainted with the issues and personalities involved and thus, when roadblocks are reached in their discussions, be in a better position to assist them to hurdle them. Others insist that a mediator should only intervene when an impasse has been reached. While the position urged by the authorities favoring immediate intervention has some merit, I cannot subscribe to it. If our national policy is sound then intervention before the parties have exhausted their own efforts to arrive at an agreement negates its purpose. All our efforts have been directed at encouraging parties to resolve their own disputes without the necessity of any governmental intervention. We insist that they should assume and exercise their prime responsibility in this respect. If a mediator intervenes before they have had an opportunity to exercise self help, there would be a resultant tendency to shirk their responsibility no matter what the nature or extent of the dispute might be. Further, it is difficult to spell out what part, if any, a mediator should play if he entered the negotiations prior to existence of an impasse. As a practical matter, it would be difficult if not impossible for a mediator in such circumstances to long avoid intervening in the discussions. As a result, when difficulties subsequently arise which could be solved by a fresh viewpoint, the effectiveness of the mediator would have been prematurely dissipated.

When a mediator intervenes his approach is based not on whether settlement is possible, but rather, how can a settlement be achieved. He will seek to instill into the parties this affirmative philosophy. From his wealth of experience and training, he can stimulate bargaining, analyze issues, factually evaluate positions, balance equities, suggest alternative approaches and solutions to problems and assist the parties to seek out areas of agreement. He brings to the dispute the impartial and objective viewpoint which often has been lost sight of by the disputants because of their individual partisan interests. By joint and separate conferences, by directing discussion, by tact, persuasion and objectivity, the mediator strives to create the atmosphere which makes agreement possible. All of his efforts are directed at one goal—an agreement acceptable to both parties.

Since mediation is an art rather than a science, the techniques which the mediator will apply to a given situation will depend in a large measure on the circumstances of each particular case. He must seek means to dissipate rampant emotions, so that reasoning can again give direction and meaning to the negotiations. He will endeavor to establish habits of agreement. If the one party is about to take a position from which graceful retreat may not be possible, he will strive to so control discussion that that possibility will be avoided. If he is confronted with rigidity of positions, and is persuaded that adherence to such positions is either unrealistic or potentially unfruitful, he will seek to raise doubts in the minds of the parties as to the soundness of their position. He knows that one of the requisites of agreement making process is the acceptance by the disputants of the frequent necessity to forego the more perfect, but unacceptable, ideas in exchange for the less perfect idea which is acceptable and hence has greater force and validity in creating agreement. Closely related to this technique is that which seeks to establish what Dr. Taylor has so aptly termed as the "consent to lose" attitude. Many times this attitude is developed by the skillful use of a mediator of the alternate solution technique. This technique becomes all the more effective when the mediator can so implant the alternate solution in the minds of the parties that it will emerge as their solution rather than his suggestion.

These are but a very few of the techniques mediators have found useful. It may be of interest that during one of our recent studies which was far from exhaustive well over 80 techniques used in the mediation process have been identified.

How successful dispute mediation has been is demonstrated by our records. During the last fiscal year, 91.6 percent of the cases which were accepted by the Service resulted in agreement.

There is another mediation function which we perform which we have termed preventive mediation to distinguish it from mediation of pending labor disputes. Preventive mediation is aimed at dispelling the causes of industrial unrest before they become manifest in an actual and costly dispute. It is an ambitious and long range program but one which, in my opinion, is both necessary and essential to the establishment of the industrial peace which we are all seeking.

The conception of this type of mediation arose out of our long study of the causes of employee dissatisfaction. It is not enough to assist parties to settle a dispute during the stress of collective bargaining negotiations. To assure a more durable relationship, the causes of such disputes must be examined and

(Continued on Page 28)

HANDLING GRIEVANCES

By Robert Roulston

Director of Labor Relations, Aluminum Industries

Based on an address to the Annual Convention, American Institute of Industrial Engineers, Cincinnati, Ohio, April 30, 1953

Most large industrial plants have union contracts of one type or another. Grievances are something that will normally occur under the contract if some member of the union feels that there is a violation of the contract or a violation of his individual rights. You also have safety grievances at times. In our plant, we sometimes have grievances filed because we have a joint safety committee.

As an example of what people sometimes think are grievances, I can tell you something that happened only two weeks ago. We're in a little bit of a tight labor situation in the Cincinnati area right now. We get quite a few of the boys from a-way down yonder—and I mean 'way down yonder. They're pretty good at shooting squirrels and fishing but, as a rule, most of these people haven't worked anywhere until they get up to Cincinnati. Some of them don't work very much after they get here.

We have been in negotiations with our union for a period of three months, and we're pretty far apart. We've had a reorganization in our company recently, and only last week, we got a new president and executive officer. Because of that, we haven't been able very well to discuss much with the union. As a matter of fact, we have a wage reopening in which the union is asking 20¢ and so far we've offered nothing—so we're pretty far apart.

Now, during the period before and during contract negotiations, if the union is a smart union—and most of them are, these days — it becomes very difficult to settle things. Normally, they'll try to put on all kinds of pressure during that period. We have a number of plants, and for each plant we have two committees. About two weeks ago, these committeemen came busting into my office, without talking to the girl or calling me, as they usually do, to take up a grievance. They had a fellow with them—one of the boys from 'way down in the woods—and the chairman of the group, who's a very outstanding guy and a smart guy and a pretty strongminded fellow, started lambasting me right away for breaking all the safety rules in the company.

I asked him, "What's the matter? What are you so excited about? Come on, sit down, take it easy."

"Well, this man almost got killed out there in the shop."

This fellow normally is pretty cute. He usually investigates everything that happens, but he was just trying to put a little heat on us because he knew we had a negotiating meeting that afternoon. I said, "Well, what goes on? You know we've got a safety committee, and if there's anything wrong, we try to take care of it."

"Ah, the machines are falling apart down there in the shop. You never take care of anything. You don't care about anybody's life. This man almost got killed. You tell him what happened."

This fellow said, "I was working down there for about a week and a half, two weeks now, and they put me on this here machine on piece work."

I said, "What kind of machine is it?"

"Well, an automatic machine. I put in the piston, just got the piston in there, big thing came down off the side of the machine, whipped me on the arm, knocked me on the floor. Right down like that."

"Well," I said. "What do you suppose—what can that be?"

"Well," he said. "Then again, the same thing happened."

So he said, "That's a hell of a thing to be doing around here. A man could get killed."

I said, "Wait a minute, what department is he in—Department 15, machining pistons?" "Yes." "Is he working on the automatic drill press down there?" "Yes." I said, "Dave, you ought to know better than to bring a thing like that in here. This guy's trying to keep his hand in there, but the guard's knocking him out of there to keep him from getting his hand cut off." We had a guard on the front of the machine that went down while the piston was in operation so you couldn't get your hand in there.

That was one time I caught him off base. He ran the guy out of there pretty fast and apologized for not investigating the grievance. But that's the type of thing that somebody tries to bring up for a grievance.

But normally, when you have grievances, they have a basis in fact. Just as I say, before negotiations and during negotiations, you get what we call a lot of nuisance grievances. Now, the way you have your setup for settling grievances is important also. If it's possible, you should try to get your grievance settled in the first stage between the foreman and the person who's aggrieved. Sometimes it's settled that way and sometimes it's settled between the steward and the foreman of the aggrieved person. Sometimes it's a little more difficult that way, sometimes it works out better. I prefer to have the foreman and the worker try to settle their own beef in the beginning, if possible.

Now, if you have an open shop and you don't have a union shop contract, a non-member of the union may bring up a grievance individually without going to the union and asking the union to present the grievance. But the union has the right to be present and listen to the settling of the grievance, to see that the settlement does not violate the union contract.

I think that industrial engineering should be consulted in the setting up of the grievance procedure because, once the grievance procedure is set up, it must be followed. And the way it's set up and the way it's followed sometimes has a great deal to do with the settlement of wages. In our shop, we have the chief industrial engineer on the committee that sets up our contract and on our negotiating committee. We think it's a good idea. We also think that the industrial engineering department can be used, in many instances, in the investigation of grievances, and do a much better job than we can in the personnel department. For that reason, we feel that they should have a voice in the setting up of the grievance procedure.

Of the major causes of grievances that I have found over a period of years, I think the biggest one is favoritism. We had a particular problem in our shop before I came to work there. The union fought viciously against any man being fired for absenteeism or any of the other causes for which people are normally fired. When I came to work there and found it out, I got the entire union committee together and tried to find out why. They said, "We have no objection to firing a guy for being absent. If he's absent too much, we think he should be fired. But we're not going to stand still and let some guy be fired who's off one or two days, while this guy over here, who takes the foreman over and buys him drinks on payday, can be absent as much as he wants to. You get some kind of a policy on the firing of people and the disciplining of people for being absent, and we'll go along with it a hundred per cent."

That's one of the big causes, and it's a human failure. We like some people better than we do others—that's natural. But if you're a supervisor running a department, you have to be impartial, and if you're not impartial, you'll run into terrific opposition from the union in trying to set up any kind of a program.

If you have a lack of knowledge by your foremen and by your supervisors of the provisions of the union contract, and the interpretations that have been made of the contract, you'll also get a lot of grievances from that. If you have a lack of a clear-cut company policy, a situation with which a lot of us are familiar, you'll have grievances coming out of your ears. Incentive programs and

their operation can cause a lot of grievances, if they're not properly handled. It was interesting to hear some of the remarks of the previous speaker, and he certainly hit the nail on the head when he talked about incentive programs. He said a lot of companies have gotten themselves out on a limb in that situation because, with the high percentage of incentive earnings over the past five or six years, they had a good many raises in salary, which has raised the base rate pretty high. They haven't been able to reduce the percentage of gain over the base rate by the piece worker, and now they're really in trouble. If they had had a realistic base rate, and set up a realistic program in the previous contracts, they wouldn't have that kind of trouble. Now, don't try to kid yourselves when you set a low base rate and try to set up high incentive earnings. Eventually, if your union is smart and you make enough mistakes, you will be in hot water.

The quality of supervision is important, and I feel that, in any well-run plant today, the supervisor should be tested, rated, and pretty well picked over. In all the plants, you'll find that a lot of guys became supervisors because they were somebody's brother or they were the best mechanics. And they probably were the worst supervisors when they were the best mechanics, because, in many instances, the best mechanic is a man who's very impatient with himself, tries to do a real good job, does a good job, and, as a result, is very impatient with anybody else who does not do the same kind of a job, when he becomes a supervisor. I think knowledge of a job is important in a supervisor. I think knowledge of human relations is much more important, and it gives you fewer grievances.

One of the things that causes you a lot of grievances is engineering or methods changes that may be made on a job while the job is in operation and after the wage has once been established. We have a particular job which caused us a lot of trouble. We do permanent molding of aluminum parts in our plant, and we have some automatic machines. We set a rate on those machines, and after the rate was set, the methods were changed and the job was then restudied. The union objected to the new rates. They objected so strongly that I went out into the shop myself and found that what had happened was that we had changed only one particular part of the job, but then we were restudying the entire job instead of just the part of the job that was changed. In doing so, we were attempting to pick up the skill that the men had built up over a period of years while working on this particular operation, and this was what the union objected to. If you have a smart union, you won't get away with anything like this. We then restudied just the part of the job that was changed, and were then able to readjust the rate without further objection from the union. But attempting to pick up the skill that the operator builds up over a period of years, when only a small portion of the operation has been changed, will get you into a lot of difficulty with a smart union.

There is no particular formula for the handling of a grievance. It's like a wrestling match—you start working, grab your best hold, start pulling, and see what happens. Sometimes you go in there and don't know what you're going to do—but don't let them get you mad. That was the toughest job I had when I first came to work for management—holding my temper—even though I knew they were trying to make me mad.

You're running all over the plant, handling all kinds of problems. When a boy has got a beef or a gripe or a grievance, to you, that's a little thing. To him, that's a big deal. Listen to him. Let him talk. Get all the details on it. Sometimes, ask him to repeat parts of it. That'll bring out additional facts. And take notes. You probably won't need them, in many instances, but it looks good, and the worker thinks it's real nice that you're taking notes. And make sure you have the real grievance. See if there's anything underneath it. Sometimes you don't have a real grievance. See if you can find out what's really bothering him. Maybe he had a fight with his wife. Maybe he's in debt up to his ears, and he's got nine or ten creditors hanging on his back. Don't think that doesn't bother a guy, and it's pretty important, because a lot of our people today are pretty much in debt. They've been working steady, making pretty good money, and sometimes they've been drawn in pretty badly. We have a credit union in our plant that operates pretty well, and we try to help the people out that way.

Try to find out if he's really got a beef or really got a grievance, or if he's merely mad at somebody. If you let him talk enough, you usually find that out. After he's all through telling you the grievance, you repeat the grievance in your own language. Take it apart, put it together, kick it around a while. Maybe you'll find that's the end of the grievance. He wanted somebody to talk to, somebody to complain to, somebody with a sympathetic ear to listen to him. Sometimes, when you get through with that, he goes out of there satisfied. Not always—but sometimes it works. And it does clear the air. It gives you an opportunity to see what kind of a fellow you're dealing with, too. Now, you've got chronic beefers and chronic gripers, and you get to know them after a while. You have people who apparently hate the company and hate the boss, and try to make trouble all the time. You have the other guy, who doesn't bring in a complaint unless it's really a complaint. You've got to let him talk to find that out. And sometimes, as I say, when you take it apart and put it together and kick it around back and forth, and let him sit there and moan about it, give him a cigarette, don't try to rush him out of the office, you find out that's the end of the beef. But not always. Sometimes it works. There's a chance it will work, so you should do it.

After you've done all that, if you have all the facts on a situation and you know what the answer is, then give him the answer and give it to him right then. If it's no, tell him so right away. If you don't have all the facts, you've got to be careful, with a smart union. They'll let you stick your head out a mile, and then they'll pull a sandbag out of their pocket and whack you with it so hard you won't recover for a week. That happens to us time after time after time. If you don't have all the facts, then back away from the question. Don't make any decision right then, rather than make a decision that you'll have to back up from later on, or setting a precedent. This is not good. So, if you have the facts, give the answer and give it to him then. If you don't have the facts, back off. Tell him when you will give him an answer. And give it to him then. Then you have to get all the facts. Sometimes, you're pretty successful in settling a few grievances, and get pretty cocky. Then, if you don't have all the facts in a case, you can really get walloped. You think you know all there is to know about a certain department and a certain operation, and you don't know all about it.

That reminds me of a story I heard about a fellow who was promoted pretty rapidly. I think he married the boss's daughter, which is a good way to get promoted. He became works manager of the plant. One day, he walked out in the shop, and there was a little old Irishman sitting over on a box and smoking his pipe during working hours. This fellow went up and down by him four or five times, looking for the foreman. Every time he went by, this old fellow smiled and bowed his head at him. He couldn't find the foreman, and finally he walked over to the old man, real pompous-like, and said to him, "You know who I am?" The old fellow said, "No, I don't know who you are. Who are you?" And he said, "I'm the works manager around here." "Is that so?" the old fellow said. "That's a darned good job you've got, fellow. See you take care of it now."

That's the feeling you have sometimes when you get yourself in there, don't have all the facts on a grievance, and get sandbagged. Our department handles rates, after they reach a certain point, when they're disagreed upon. Many times, we sit in there and we don't have all the facts, and it's kind of difficult. So get the facts. Make sure. You can't be too sure. Check all the details. Talk with everyone who's involved. Check the union agreement. Talk to your supervisors. Check the employee's record to see how to deal with him. See if he's a chronic troublemaker, how long he has been employed, make a good check with

industrial relations, and, most important of all, make sure you know what you're talking about in there, because, believe me, enlightened union members today and enlightened union committee men know what they're talking about. It's their job to know what they're talking about. If they don't know what they're talking about, they won't be on the job for very long. Unions, and I worked for one 15 years, are not very benevolent employers. You either deliver or else—in the lower brackets. So they know what they are talking about, usually, when they come in. They put up a pretty good argument, a lot of times. They'll exaggerate, they'll have a lot of half-truths, and they'll attack. The important thing to do is to know the facts, and don't lose your temper.

When you have the facts, then make a decision, and make it as quickly as possible. Be sure you have all the answers. If you're wrong about it, admit it. Don't admit it grudgingly and act as if the guy has won a victory over you. Tell him where you're wrong. I usually thank the guy for calling the matter to our attention, and handle it right away. In many instances, we ought to thank them, because there are lots of things going on in the shop that we never would know if we didn't have a grievance.

And remember one thing; as an employer, you get the kind of union you deserve. That's right. If you've been a pretty good employer, you get a pretty good union, if you deal with them fairly. If you're going to kick them around all the time, it will only make them bitter. You make them immune to logic. All they will say is, "Listen, you gave it to us for the last fifteen years, now we want to give it to you." After fifteen years of dealing with the union in the wrong manner, you can't correct it in a year. We're making progress, pretty well. It's about time.

Now, if the fellow is wrong, and you have to tell him no, try to explain it to him. Try to let him leave your office feeling pretty good. Give him a chance to save face, if there's any way to save face. And when you're dealing with the union committee, always remember, give them a chance to save face too. You know, even a rat backed up in a corner will fight. Always give the other guy a little opening so that he can get out of it gracefully. Just remember that you're dealing with them today and tomorrow you're going to be there too. You're going to have to deal with them again. Don't try to kid anyone. Some of you guys may do that. So, if you get a chance to straighten him out, straighten him out. If he still beefs and complains, tell him what he can do to go beyond you, and explain to him how he should do it, the procedure he should take. Tell him exactly how he can go over your head and whom to go to.

However, if a decision is properly made, if it is backed up by top management, it shouldn't be reversed. All you have to do to create chaos in your department is to tear down the respect of the union for the people in any department—either engineers or industrial relations men, or anyone else. Once you make a decision that everybody considers proper, and somebody on top changes that decision, you can pick up your marbles and go home. That's what happens a lot of times. So, if you check company policy and everything is agreed to by management, you don't have to be afraid to tell him whom to go to. He won't very often go over your head under the circumstances. Sometimes he will, when you get involved in principles. If you feel he will take the grievance further than you, see to it that you get all the facts down on paper so that the person who handles the grievance after you will know everything there is to know about it, and will be in a position to handle it correctly.

In many contracts, we by-pass many of the steps of the grievance procedure. Some can be taken up directly with top management or the top people in plant management. Now, grievances of a general nature are, in most instances, an attempt to negotiate something different in the agreement, or to change something in the agreement without waiting until the end of contract time. You have to be very careful about it and make sure that they are proper grievances.

We had a problem in our shop—a machine down-time caused by maintenance problems. We pay base rate in one of our plants, and in the other, we pay average earnings. That was caused by not having an industrial relations department which was over both plants. We ran one company; the two plants ran like separate companies. The union filed a general grievance in which they maintained that all down-time at the other plant should be paid for at average earnings. It would have cost us a fortune. Checking back, we found that, historically, in this one plant, we had never paid anything but base rate. So we took the position that it wasn't a proper grievance, that our historical position here had been, even under the same contract, to pay base rate, and that we weren't going to pay anything else. We fought that all the way up to arbitration, and the arbitrator took the position that we were right, that what the union was attempting to do was to negotiate a change in the contract, and he wasn't going to do it. The union was trying to take the position that, because we paid it in one plant under the contract, we should have paid it in the other. Now, I think we were kind of lucky in that one. We fought it in the same position all the way down the line. Merely because we had all the facts and an historical precedent in this one plant. Now, that's why the handling of grievances is very important—very important, to engineers and everybody else. Because what you settle in a grievance, if it pertains to the contract, whether it is written in the contract or not, becomes a part of that contract.

It looks to me as if what the unions are fighting for is a guaranteed wage. Then the piece work will be wiped out, or they will attempt to wipe it out. That's one of the things you have to watch out for. That's why it's important to get your facts. And some pretty important people can get mixed up on their facts. I heard a story the other day about a boy in the hospital, three years old. He was pretty sick, and they had a group of doctors come up and look him over. He was in a wheelchair, he had a little trouble with his legs, and they asked this little boy to get up and walk across the floor. He did, and as he walked across the floor, he had his hands pressed tightly across his middle. When the doctor said to him, "Can't you move your hands?" he said, "No." Another doctor said, "What's the matter, do they hurt you?" He said, "No." "But you can't move them?" "No." Finally, one old doctor, about seventy years old, been dealing with kids for a long time, said, "Will you give your hands to me, son?" He said, "No, I won't." The doctor said, "Why?" He said, "If I move them, my pajamas will fall down."

So you have to know the facts in every case, and in handling grievances, I think it's more important to know your facts than at any other time. I don't think there is any set way for handling a grievance. I think the grievance procedure that I have outlined here gives you a pretty good set of principles. In the normal handling of grievances, it sometimes gets pretty rough and tumble, and, as I said before, you look for an opening, get your best hold, start plugging, and see what happens from there on in. But if you do get the facts and give the people a chance to talk, you'll come out pretty well in the handling of grievances. You don't get anywhere from trying to kid people. You don't get anywhere from trying to kid union people.

One of the ways that industrial relations can be very helpful to industrial engineering is at a time like this, when we are in negotiations and we have a great deal of uproar in the shop. We try to notify industrial engineering that this is not the best time in the world to go out and make methods changes and try to set rates, because we know that they are going to get terrific opposition. We are trying to save the engineer a little bit of a headache. We know when the contract is settled, these things that we're trying to do now will fall into place. We also know that if we have trouble with a particular department, if we have an unsettled grievance in that department, if we have a group of people within a department who are trying to run things, industrial engineering should know about it and know who the people are so they can proceed accordingly in their setting of rates. We find that in some unions in some industries, the membership is stronger than the leadership of the union. In some instances, it is, and shouldn't be that way, because if you're a leader, you should be a leader,

and you should run things. You find that you get down to the point where you no longer bargain with the union on rates, but you have individual bargaining, because the union committee is so afraid of the membership that when a rate is brought up and there's a dispute over the rate, instead of the union committee making a decision as to whether the rate is a proper rate or not, they go down to the individual and ask if he's satisfied with the rate. If he says no, you have trouble. That's what will happen in many instances, and engineering should know about the department in question.

We have a couple of departments in the plant that are almost like little unions in themselves. They cooperate with the rest of the union committee except when something comes up that they don't like, and then they don't cooperate with anybody.

When setting up job evaluation systems, unions and industrial relations departments can work very closely together. I'll tell you something very interesting. For fifteen years, I worked for a union, and for ten years, the worst guy I could think of in the world was the industrial engineer. If there was a guy I didn't like, it was him. Brother, any time I had to deal with him, there were sparks flying. Well, there was a reason for it. First of all, my experience with industrial engineers when I worked in the shop was based on the Halsey 50-50 system, the Bedeaux system, and with many take-offs of that system. Well, what happened to us under piece work was that we made so much money, and when we made over that much, some guy would come in with a stopwatch, time the job, cut the rate, and we had to work like hell to make what we made before. I think that during the period when that was going on, in the twenties, we lost perhaps 50% of the potential production of this country. You still hear of people today, working in the shop, who remember those things. They are afraid to give you an all-out effort—even with a union in the plant. I don't think you will find ten union plants in this country that have a piece work system that don't have a controlled production. They have it. They tell each department how much money they can make, and that's all. You heard what the other man said about the fellows who work up to 2 o'clock and have the day made. That's all they make.

That's brought on by the thing that happened before we began to become a little bit enlightened about industrial engineering, and to find out that industrial engineering is something that can be used for the benefit of both parties, and not merely to try to cut a worker's wages. In about ten years of working for the union, I didn't like industrial engineers, and I'll tell you why I didn't like them. I didn't like them because I didn't know what they were trying to do. I didn't know anything about industrial engineering. I didn't like them because I didn't understand them and, in ignorance, the only thing I could think of was to resent them. Then, about seven or eight years ago, we were able to persuade our union to send us to a university for some courses on industrial engineering. And when I found out what the industrial engineer was trying to do, I felt sorry for him instead of hating him. I wasnt afraid of him any more. Now, I think that's important for you boys working with people every day. You go out to do something on a job or a particular operation and you go out with a big board and a clock and stand there—and nobody likes you. Go out there and get friendly with the man. Talk to him, and when you get through, talk to him again. Try to act as if he's another fellow trying to make a buck just like you, because that's what he is. Try to make him understand your problems and what you're trying to do, because you, as an industrial engineer, are part of the front line of management. You are trying to put in a system or keep a system straight. The feeling that the people in the plant have toward you has a great deal to do with the kind of thing they'll come in and try to do to the industrial engineering program in the contract. You give them a fair shake out there—and that's what you're supposed to do—and you'll get along all right. We have one of the toughest unions in town on the setting of rates. We don't set any rates. We go out and time study jobs, then we negotiate the rates with the union. That's been in effect for about five years. And it's pretty rough. We are fairly successful, but in many instances, in certain departments, we're pretty far out of line. We are one of the companies that has a low base rate and a high incentive. We have a balloon figure of 59¢ an hour hanging over here that's added on to a man's pay at the end of the week, instead of being in his base rate with a proper incentive. Our union came to us about eight months ago and said, "Look; you know we're pretty tough on the setting of rates. But, before God, we ain't crooked. We've got a time study man out here who made us a proposition. We pay him on the side, and he'll set the rates the way the union wants them." When we found that out, he went out the door. The union took the position that they would fight for what they wanted, and when they get it, they'll fight to hold it.

I'll tell you some of the things that happen to people under the piece work system. When I worked in an upholstering shop, we got $1.60 a chair. This chair had a knuckle arm. This was made of wood and had nothing to do with the upholstering. We changed it and made it a claw instead of a knuckle, and cut the rate. This shop was non-union, and we got 25¢ less per chair for doing the same amount of work. So, when the union came around, we were ready to be organized, and we fixed them good. Now, in this shop, when I became business agent of my union, I'll tell you how we set prices. We made three jobs, and after we made the three jobs, we didn't make another job, we got the price set. Ninety five per cent of the shops of the Upholsterers' Union had a contract and set no permanent rates: Every rate we set was a temporary rate, and there was a ten day period, a two week working period, in which the worker had the right, as the other fellow, he couldn't grieve during that period, then he could grieve. Then we took up the matter of the rates, and if we got it settled, it was retroactive from the time the job started. There's a cause for everything, including union contracts against management. People don't just sit up at night and dream these things up. A boss did something. Next year, the union puts something in the contract to try to stop him from doing it. Working with the people out in the shop in setting rates can make the job of industrial relations much easier. There are guys about whom the unions say, "We'll take this guy's word any time. If he says it's the proper rate, we're not going to argue." There are other guys—every time they set out to take a rate, we have a grievance on the list. Why is that? It's because the man who's an industrial engineer or a time study man or a methods man hasn't sold himself to the people in the shop. You have a selling job to do. And your job is much easier once you're accepted by the people out in the shop. Those people are out to make a living and they want to make it the best way they can, and want to make as much money as they can. Most of them want the boss to make a buck too. They don't want to be cheap. They don't like any guy out in the shop who thinks he's better than they are, because he's not, in their opinion. You know that "pie in the sky" propaganda we got when we were in school. Any guy can be president of the United States. Each guy thinks he's just as good as the other. You go out there and try to deal with those people in a human fashion, just like you'd like to be dealt with. You sell yourself to them, and your job of setting standards and setting rates and making methods changes will be so much easier that you'll be amazed. You walk in there and try to tell them that you know all about it, and they don't know anything about it, and you have trouble, because there is no one who knows as much about the operation of a machine as the guy who runs it eight hours a day, 360 days a year. He could teach you.

There is another thing that is important, and that is communication between departments. I think you boys have run into this many times, and I know it always winds up in my lap in industrial relations as part of a grievance, and that is communication between mechanical engineering and industrial engineering when there are two divisions within a plant. I'll give you a concrete example of that. We have a machine in our plant

(Continued on Page 20)

REPORT OF THE CURRICULUM COMMITTEE OF A.I.I.E.

The curriculum committee of the A.I.I.E. has completed a survey of the courses in mathematics and statistics required for the B.S.I.E. degree in 20 accredited engineering schools. The 29 accredited schools were asked to submit data, 21 replied and 20 sent the information requested. [1] We asked for a list of courses and units offered during the years 1947-48, during 1952-53, and we also asked the question "Please list total semester hours of mathematics and statistics that you would like to have for your industrial engineering program in your school by 1955-56." Two of the schools reporting did not reply to this question. One of the schools, we might add, offered work for the B.S.I.E. degree in 1950-51 for the first time.

Conclusions

The following conclusions pertain to the required courses in mathematics and statistics for the B.S.I.E. degree.

1. Only three schools have increased the required number of units of mathematics during the past six years. The increases were 1 unit, 1½ units and 4 units. One school has decreased the number of units by six. Three schools state that they would like to increase the number of units by 1955-56 and two schools want to reduce the number of units. The unit increase totals 7 and the unit decrease totals three.
2. Eighteen of the twenty schools reporting now require at least one course in statistics whereas in 1946-47 only eleven schools required courses in this field. Of the twenty schools reporting, eight have increased the required number of units in statistics and six schools would like to see the units still further increased by 1955-56. The increases rang from two units to five units, with an average of three units. The contemplated additional increases range from one unit to six units with an average of almost three units.
3. A considerable number of mathematical and statistical techniques are now finding applications in industrial engineering courses. The accompanying list was taken from the returns of the twenty schools.

A.I.I.E Curriculum Committee:

Phil Carroll
H. W. Spitzhoff
W. G. Stanton
R. O. Swalm
Ralph M. Barnes, Chairman

May 1, 1953

[1] Replies from four more schools have been received since this report was completed. However, the additional data would not substantially affect the results of the survey.

Mathematical and Statistical Techniques	Applications to Industrial Engineering Courses
Probability Theory	Ratio-Delay study in plant layout. Ratio-Delay study in time study. Sampling plans in quality control.
Differentiation: 1st derivative = 0	Production and inventory lot size. Minimum cost points. Engineering economy, break-even points.
Curve fitting (least squares)	Job evaluation regression lines.
Nomographs	Number of time study readings. Standard data in time study. Allowances in time study.
Analysis of Variance	Design of experiments in time study. Time study readings. Examination of significant differences between methods and raters.
Normal Curve	Distribution of individual abilities. Accident Distribution in industrial safety. X & R Charts for variables, quality control. Rating in time study. Class wage determination from local survey (Job Evaluation). Performance index distribution.
Binomial Distribution	"p" charts, quality control Control of accident rates in industrial safety.
Poisson Distribution	Approximation of binomial distribution in quality control. Number of service centers in a manufacturing plant.
Algebraic Derivation	Compound interest formulae.
Integration	Area under normal curve.
Correlation	Establishing standard data. Distance-time relationship solutions.
Appropriateness of mean, median, mode, etc.	Time study
Addition of variances	Mating of parts,—tolerance limits.
Linear functions & simultaneous Equations	Engineering economies; breakeven points, plant operation costs, etc.
Epsilon squared	Concept of time study rating.

HANDLING GRIEVANCES

(Continued from Page 19)

with which we rough-turn pistons. We make pistons for the automobile industry. We make about 15, 20 thousand pistons a day. Some of them we send out after the gates and risers are cut off to the manufacturer who does his own turning. Some of them we rough-turn, and we leave about twenty-thousandths on there for the manufacturers' lathes. We have a machine out there that used to turn about 1500 pistons a day. Somewhere along the line, somebody changed that machine, changed the gear. He put a different type of gear in it, didn't write anything out, didn't change the specifications on the job, or on the write-up of the job. The machine now turns out 3300 pistons a day. Nobody told industrial engineering about it, the foreman didn't pay any attention to it, and it ran that way for three and a half years. The rate on the machine was 950. Suddenly, the plant manager gets all excited about it, and he comes to me, and he wants me to get the union to change the rates. So I go out and give the union an argument—what kind of a deal do we have here, the guy's making 350%. "What the hell do we care? He's working for it, isn't he?" I tried to find out why, so the union says, "Somebody changed the gears on the machine 3½ years ago, but nobody knows who did it or how they changed it." They admitted it to me. They said, "You're not going to change the rate now." And we haven't. If mechanical engineering or the production department or whoever ordered the change in that machine at that time had had proper communication with industrial engineering, the minute the change was made, industrial engineering would have gone out and restudied the rates.

To sum it all up, industrial engineering and industrial relations should be very closely tied together. They should work very closely together, because what one does affects the other. If we make a lousy contract, if we negotiate a bad setup for setting rates, you suffer. If you don't do a good job out there in the shop, we suffer.

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Time Study Rating Evaluation

By Gerald Nadler, Ph.D.
Associate Professor Industrial Engineering
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Companies are continually increasing the size of their staffs of time study men. All Industrial Engineers are familiar with the problems of rating when done by just one person. The larger the number of people setting rates in a plant, the more complex becomes the problem of ascertaining the accuracy and consistency of the rates set.

More attention must be given to the techniques and procedures whereby the ratings of an individual and/or group can be evaluated. These evaluations are essential to make certain that one individual is consistent in rating and that the group is consistent within itself. Consistency is the most desirable trait of time study ratings. If a time study man becomes consistent, a mathematical correction can make his ratings accurate. Therefore, most of the ensuing discussion, consistency is the prime consideration.

Rating, for this discussion, is considered the process used for comparing the observed performance of an operator to a standard performance. Many systems and procedures are advocated to make this comparison accurately. Experimentation and industrial application have shown some of the systems to be more accurate and consistent than others. The step film procedure of rating in conjunction with job difficulty factors has usually been found to be the best system available today. Although one system may actually be more accurate than others, the process of trying to keep the rating within the accuracy and consistency capabilities of the system being used still remains. To get the best results from the evaluation techniques, different systems of rating should not be mixed when making the group analysis.

The errors obtained in rating practice sessions can be attributed to three factors:

1. Rating system
2. Time study man's judgment
3. Film (such items as methods inconsistency, camera angles, etc.) It is virtually impossible to separate the errors due to the system from those due to the men themselves. In the following discussion, when errors of observers are mentioned, the combination of system and observer errors is meant.

The ratings to be evaluated are collected in the usual way. Normally motion pictures of various jobs performed at various speeds are presented to the group. Each sequence or speed of each job is then rated by each individual. All of the ratings of the individuals are recorded. Enough time should be allotted to the rating process to make certain that each individual has rated each sequence of each job. This condition is essential to make certain that the analysis applied later have complete meaning. After the data has been collected, it can be placed into the form of Table 1. Each individual's rating for each sequence is noted. Table 1 also includes two possible criteria for evaluation purposes. One is the actual rating as recorded on the sheets accompanying such film and the second is the average of the group for each sequence. The analyses mentioned later will indicate the use that can be made of either or both of these criteria.

The initial step in the analysis of rating is the conversion of the raw rating data to errors. On this point of conversion to errors there is some discrepancy among practitioners as to what should be done. Most people convert to error with the obtained rating of an individual being subtracted from either the actual rating or the group average rating. The errors found by the above subtraction are then used in the analysis of ratings. This approach seems wrong since the problem of rating is to make certain that at every performance level the standard which is finally arrived at represents a consistent level for earning opportunity. This condition is not met by using the subtraction alone for error calculations. An illustration should help clarify this problem.

If the actual rating for a job or element were 70 and the time study man called it 75, according to the system mentioned above, the error would be +5 rated percentage units (RPU). In the same way, if the actual rating for a job or element were 130 and the time study man called it 135, the error would still be +5 rated percentage units. Let us now assume that the true standard time for this job or element is one minute. With a true rating of 70, the time taken (observed time) by the operator would be 1.43 minutes. With a true rating of 130, the time taken (observed time) by the operator for the same job would be .77 minutes. Multiply 1.43 minutes by the obtained rating of 75 and the standard time is 1.07 minutes. Multiply the .77 minutes by the actual obtained rating of 135 and the standard time of 1.04 minutes or 3% error is obtained. As the actual rating increases, the error in rated percentage units can become larger to maintain a consistent level of rating. To analyze ratings properly, convert the difference between the actual rating and the observed rating into a percent error by the following formula:

$$\% \text{ error} = \frac{\text{observed rating} - \text{actual rating}}{\text{actual rating}} \times 100$$

Percent of error is not only important for determining final standards, but for training in ratings. By using the RPU procedure to calculate an individual's errors, it is possible that the trend obtained is the opposite of the actual trend. This can best be illustrated by the ratings of Table 1 by the RPU and % error procedures. Table 2 gives the results of the calculations. By analyzing these calculations with the procedure indicated by Prof. Barnes in his "Work

TABLE 1

Collected Data

Sequence No	Actual Rating	Obs A	Obs B	Obs C	Obs D	Obs E	Obs F	Obs G	Group Av
1	97	100	95	95	105	100	90	97	97
2	82	85	80	85	80	85	100	75	84
3	106	95	110	100	110	100	105	85	101
4	72	70	65	75	60	70	80	60	69
5	118	115	130	110	120	110	120	100	115
6	93	105	90	90	105	90	85	85	93
7	61	75	50	60	70	60	70	55	63
8	107	100	115	105	100	105	105	100	104
9	81	95	95	85	85	85	100	95	92
10	92	85	95	90	95	90	90	100	92
11	115	100	90	100	110	80	100	105	98
12	83	75	75	80	80	50	80	95	84
13	130	125	120	110	120	115	110	115	116
14	94	80	85	85	90	75	95	100	87
15	103	100	115	110	105	90	95	105	103
16	143	105	105	120	120	100	105	115	110
17	119	95	100	105	105	90	100	100	99
18	71	75	70	80	65	50	80	75	71
19	59	60	50	65	55	50	70	65	59
20	128	135	120	130	125	115	130	140	128
21	60	90	80	80	95	95	75	80	85
22	116	125	105	115	115	100	115	120	114
23	145	160	135	110	130	110	125	135	131
24	105	100	95	100	100	115	115	110	105
25	73	80	100	90	90	105	85	100	93
26	115	105	110	110	110	120	100	130	112
27	46	60	80	75	95	90	80	85	80
28	95	100	100	105	90	125	115	125	108
29	100	80	80	105	100	115	90	100	96
30	122	115	105	115	110	105	105	110	108
31	154	150	140	125	125	120	120	155	135
32	40	50	50	70	60	60	55	35	54
33	31	60	40	50	50	50	50	20	46
34	153	180	150	115	120	105	140	150	137

Measurement Manual," the results of Table 3 are obtained.

Notice the differences in the final results when the analysis is made from the percent error method rather than the RPU method. For example, when analyzing errors by the RPU method, observer E had an RPU error of minus 6. When evaluating his errors by the percent error procedure his errors averaged zero. In some cases, as in that of observer C, the trend reversed itself. In the RPU analysis, observer C had a negative trend, while the percent error analysis showed a positive error. The same types of differences occur in calculating the mean deviation and the absolute error from the two procedures. It is important to note that when using the RPU procedure, the individual rater may be told to correct his ratings in one direction where he should be correcting this errors in another direction. The mean deviation calculations show that an observer's variation of ratings is concealed by the RPU calculations. In the rating-training problem, it is important that, first, the variation about the value of the individual's average be reduced and then, secondly, his average should be moved so that it becomes more accurate. This is the same as attempting to make the individual rater more consistent (reduce his variation in rating) and then trying to make his ratings more accurate (move his consistent ratings to the 45° slope in the middle of the ±5% area). Most of the following procedures for analyzing ratings will utilize the percent error rather than the RPU error. Wherever the RPU error is used, it will be noted in the discussion. (The data presented in the illustrations in this paper represent wide variation due to the film being used. However, the data is presented here because this wide variation actually helps to point up the differences in the analysis techniques and procedures being presented. These differences would not be as apparent if the film were more like the film which might be used in an industrial plant.)

Table 2

Differences Between collected and Actual Ratings

1—In Terms of Rated Percentage Units

2—% Error $\left(\frac{\text{Rated Percentage Unit Difference}}{\text{Actual Rating}} \times 100 \right)$

Seq. No.	Obs A		Obs B		Obs C		Obs D		Obs E		Obs F		Obs G	
	1	2	1	2	1	2	1	2	1	2	1	2	1	2
1	+3	+3	−2	−2	−2	−2	+8	+8	−3	−3	−7	−7	0	0
2	+3	+4	−2	−2	+3	+4	−2	−2	+3	+4	+18	+22	−7	−8
3	−11	−10	+4	+4	−6	−6	+4	+4	−6	−6	−1	−1	−21	−20
4	−2	−3	−7	−10	+3	+4	−12	−17	−2	−3	+8	+11	−12	−17
5	−3	−2	+12	+10	−8	−7	+2	+2	−8	−7	+2	+2	−18	−15
6	+12	+13	−3	−3	−3	−3	+12	+13	−3	−3	−8	−9	−8	−9
7	+14	+23	−11	−18	−1	−2	+9	+15	−1	−2	−9	−15	−6	−10
8	−7	−6	+8	+8	−2	−2	−7	−6	−2	−2	−2	−2	−7	−6
9	+14	+17	+14	+17	+4	+5	+4	+5	+4	+5	+19	+23	+14	+17
10	−7	−8	+3	+3	−2	−2	+3	+3	−2	−2	−2	−2	+8	+9
11	−15	−13	−25	−22	−15	−13	−5	−4	−35	−30	−15	−13	−10	−9
12	−8	−10	−8	−10	−3	−4	−3	−4	−33	−40	−3	−4	+8	+10
13	−5	−4	−10	−8	−20	−15	−10	−8	−15	−11	−20	−15	−15	−11
14	−14	−15	−9	−10	−9	−10	−4	−1	−19	−20	+1	+1	+6	+6
15	−3	−3	+12	+12	+7	+7	+2	+2	−13	−13	−8	−8	+2	+2
16	−38	−27	−38	−27	−23	−16	−23	−16	−43	−30	−38	−27	−28	−20
17	−24	−21	−19	−16	−14	−12	−14	−12	−29	−24	−19	−16	−19	−16
18	−2	−3	−7	−10	+3	+4	−12	−17	−27	−38	+3	+4	−2	−3
19	+1	+2	−9	−15	+6	+10	−4	−7	−9	−15	+11	+19	+6	+10
20	+7	+5	−8	−6	+2	+2	−3	−2	−13	−10	+2	+2	+12	+9
21	+30	+50	+20	+33	+20	+33	+35	+58	+35	+58	+15	+25	+20	+33
22	+9	+8	−11	−9	−1	−1	−1	−1	−16	−14	−1	−1	+4	+3
23	+15	+10	−10	−7	−35	−24	−15	−10	−35	−24	−20	−14	−10	−7
24	−5	−5	−10	−9	−5	−5	−5	−5	+10	+9	+10	+10	+5	+5
25	+7	+10	+27	+37	+17	+23	+17	+23	+32	+44	+12	+16	+27	+37
26	−10	−9	−5	−4	−5	−4	−5	−4	+5	+4	−15	−13	+15	+13
27	+14	+30	+34	+76	+29	+63	+49	+107	+44	+96	+34	+76	+39	+85
28	+5	+5	+5	+5	+10	+10	−5	−5	+30	+32	+20	+21	+30	+32
29	−20	−20	−20	−20	+5	+5	0	0	+15	+15	−10	−10	0	0
30	−7	−6	−17	−14	−7	−6	−12	−10	−17	−14	−17	−14	−12	−10
31	−4	−3	−14	−9	−29	−19	−29	−19	−34	−22	−24	−17	+1	+1
32	+16	+25	+10	+25	+30	+75	+20	+50	+20	+50	+15	+37	−5	−12
33	+29	+93	+9	+29	+19	+61	+19	+61	+19	+61	+19	+61	−11	−35
34	+27	+18	−3	−2	−38	−25	−23	−15	−48	−31	−13	−8	−3	−2

TABLE 3

Rated Percentage Unit and Percent Error Differences

Rates Percentage Unit

Observer	A	B	C	D	E	F	G	Group
Average Error	+ 1	− 3	− 2	0	− 6	− 1	0	− 2
Mean Deviation	11	11	12	11	18	12	11	12
Absolute Error	11	12	11	11	19	12	11	12
Average of Mean Deviation								12

% Error

Average Error	+ 4	+ 1	+ 4	+ 5	0	+ 4	+ 2	+ 3
Mean Deviation	15	15	15	17	32	16	15	16
Absolute Error	14	14	14	15	22	15	14	15
Average of Mean Deviation								16

The techniques presented below are in two groups: (1) Analysis of one individual's ratings, and (2) analysis of the group's ratings. The techniques are presented more to indicate what they are and what they tell than to tell how to make the calculations. Old techniques are presented with new techniques to present a clear picture of all analyses.

INDIVIDUAL RATING ANALYSIS TECHNIQUES

The techniques listed below can be used for one man doing rating alone in a company or for each individual in a group doing rating in a company.

1. **Graph of Actual Rating Vs. Observers' Ratings.** This is one of the most usual analysis techniques. Figure 1 shows the form wherein a constant five or ten rated percentage units are drawn on either side of the 45 degree slope through the origin. This is not desirable as was indicated for the percent error calculations above. As the readings become larger the RPU difference can become larger as well to maintain the same percentage error differential. Therefore, it is recommended that the usual graphic presentation be that of Figure 2, wherein ±5% limit lines go through the origin. By using the graphical presentation in Figure 2, it then becomes possible to indicate to each observer the trend of his individual ratings. The big drawback and limitation to most graphical presentations is that they give only general information and do not give anything specific from which the observer may work. The numerical analyses presented above and below give the individual ob-

server some quantitative measure of what he is doing and therefore a better picture of his progress. However, it is frequently desirable that graphic presentations be used to get across certain ideas of rating. There is, of course, a direct relationship between the graphs and the analyses stated above. For example, as the trend line in Figure 2, becomes less and less in slope, the mean deviation would increase. Therefore, both graphical and quantitative analyses are presented.

2. **Average Percent** Error. One of the most important measures directly concerned with rating is the average percent error of the individual. The average percent error is obtained by first, subtracting the rating value given from the actual rating and then dividing by the actual rating. Next all of percent error are added, remembering to include the plus or minus sign of the percent error. Divide this total by the number of sequences rated. For an illustration, observer A in Figure 2 has an average percent error of +4. This is interpreted as meaning that on the average observer A was rating 4% higher than the actual ratings.

3. **Standard Deviation of Percent Error.** The average of a series of values does not tell the complete story about the series of values. The average percent error calculated above is the representation of the accuracy of an individual's rating. However, an important measure is the consistency of the individual's rating. Consistency is found by determining how widespread are the values making up the average. If the values are very widespread then there is a lack of consistency. If the values cluster very closely about the average percent error then the consistency is good. The most effective measure of how far spread or how much the values cluster about the average is the standard deviation.

The standard deviation is calculated by the following formula:

$$S.D. = \frac{\sqrt{N \Sigma X^2 - (\Sigma X)^2}}{N}$$

The term ΣX is the algebraic summation of the percent errors. The term ΣX^2 is the sum of each of the individual percent errors squared. N refers to the number of values comprising the summations. For observer A $\Sigma X = 148$; $\Sigma X^2 = 956$; $N = 34$. Substituting these values into the formula a standard deviation of 21.8 is obtained.

The standard deviation allows an important interpretation to be made. For example, the standard deviation indicates that 68% of the time observer A had as much variation as ±21.6%, about the average percent error of +4. It also indicates that 95% of the time observer A had as much variation as ±43.2% about the average. In usual time study discussions, ±5% error is considered to be excellent rating. Therefore, it is obvious that observer A was not rating consistently.

4. **Correlation.** Correlation is a statistical figure stating a quantitative relationship between two variables concerning the same item. For example, there are two rating factors obtained from the one set of film. One rating is the actual rating and the second rating is the observer's rating. Using the standard procedure for calculating correlation [1], observer A had a correlation of .89 with actual rating. A perfect correlation would be ±1.0 and a correlation indicating no relationship would be 0. Therefore, it might be concluded that observer A was at least able to discern increases and decreases in rating values but not in a perfect relationship. This is somewhat obvious from the data. However, the correlation figure allows a numerical comparison from one rating session to another.

5. **Regression Equation.** The regression equation is used to predict what an individual will rate given an actual rating. The calculation of the regression equation is directly dependent upon the correlation figure calculated above. Using standard formulas [2] for the prediction of an individual's rating given the actual rating, observer A has a regression equation of $Y = .80x + 19.7$. Sub-

[1] Peters and Van Voorhis, **Statistical Procedures and Their Mathematical Bases**, McGraw-Hill: New York, 1940.

[2] Ibid.

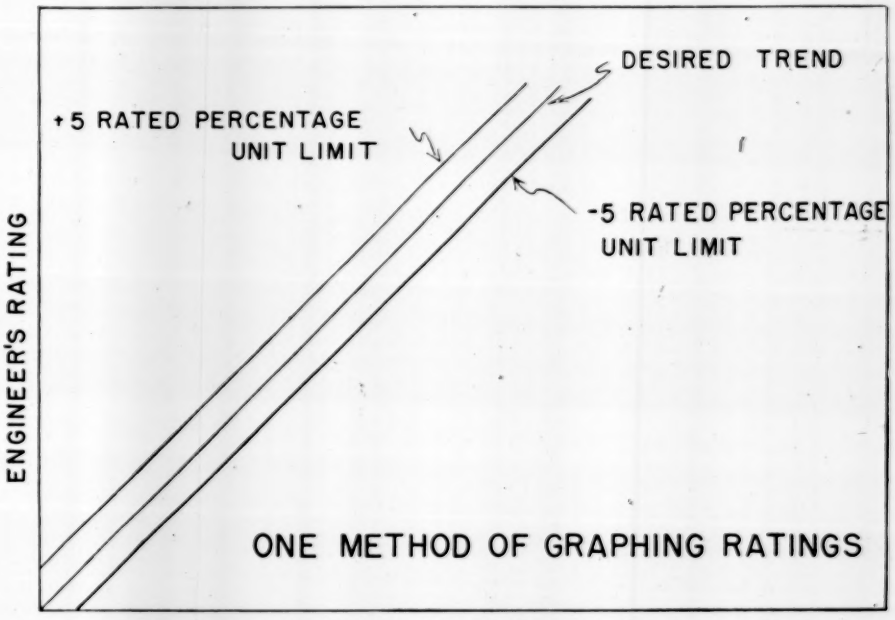

Figure 1

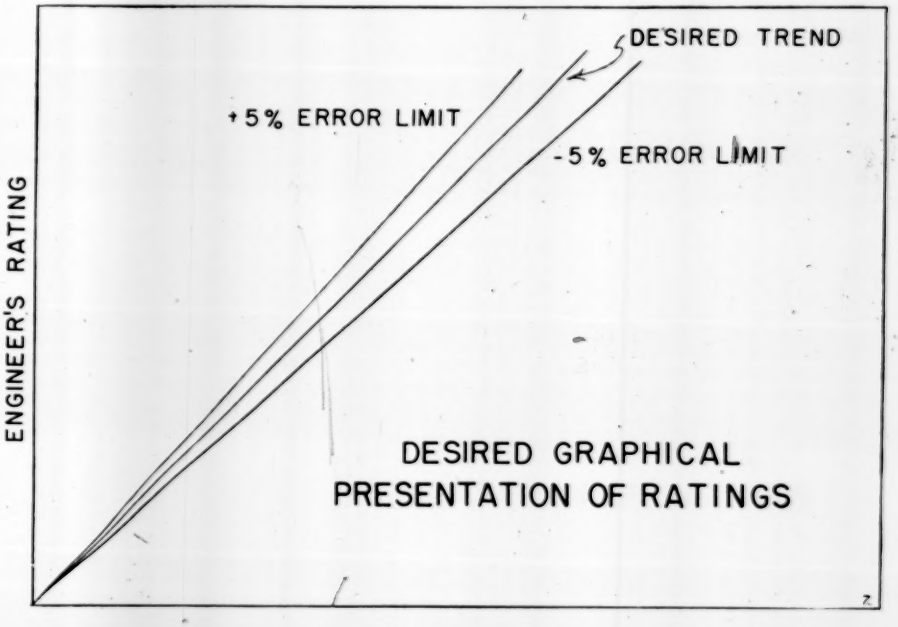

Figure 2

stituting the actual rating as x the value y most likely to be given by observer A can be calculated from the formula.

It is also possible once a group has done some rating, to relate the observer to the group average. If observer A is correlated with the group average, a correlation of .92 is obtained. The regression equation under these conditions for observer A is $y = 1.17x - 15.4$. Given the average value of the group for a given sequence, and substituting it for x in the above formula, the rating most likely to be given by observer A can be calculated by the formula.

6. **Graph of Percent Error Versus Actual Rating.** The graph shown in Figure 3 is a slight variation of the type of graph shown in Figure 2. The value of Figure 3 is the graphic relationship of the actual percent errors to the actual ratings. It becomes important that the individual rater attempt to have the slope of his trend line as indicated in Figure 6 as close to horizontal as possible. It is not essential that the trend line of a rater be on top of the 0% line but at least be parallel to the 0% line to assure consistency.

7. **Slope of Trend Line in Percent Error Versus Actual Rating Graph.** In most industrial uses the trend line in Figure 3 will be drawn from observation. A numerical or quantitative measure of rating ability is the slope of this trend. As mentioned in 5 above, the best slope is horizontal or 0. The smaller the actual number, whether negative or positive, the better the rating. To calculate the slope easily, extend the trend line until it crosses the ordinate. Determine the intercept, b, which is +38 in Figure 3. Pick out any point x, y which could be $x = 80$, $y = +10$ in Figure 3. Using the formula $y = mx + b$, solve for m, the slope. In this case the slope, m, is equal to $-.35$. To rate better observer A would have to bring his m closer to 0. Using m as a measure of rating ability, a time study man could have a quantitative measure of his progress, which could be charted to show his progress. (It is also possible to calculate the slope of the trend line in Figure 2 to use as a measure of rating ability. The preference for using slope in conjunction with Figure 3 arises because of the seeming greater sensitivity in charting and estimating trend lines.)

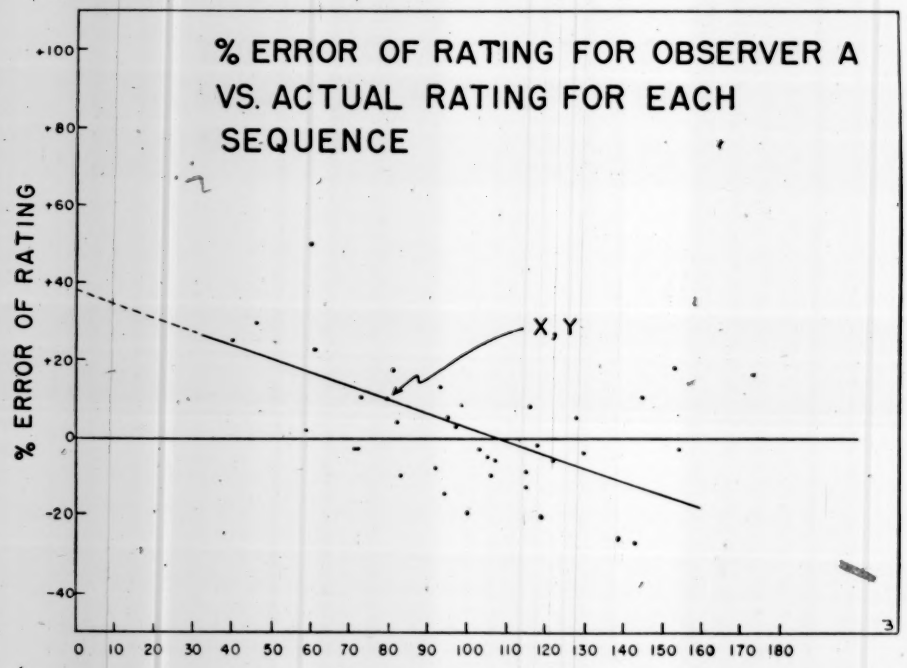

Figure 3

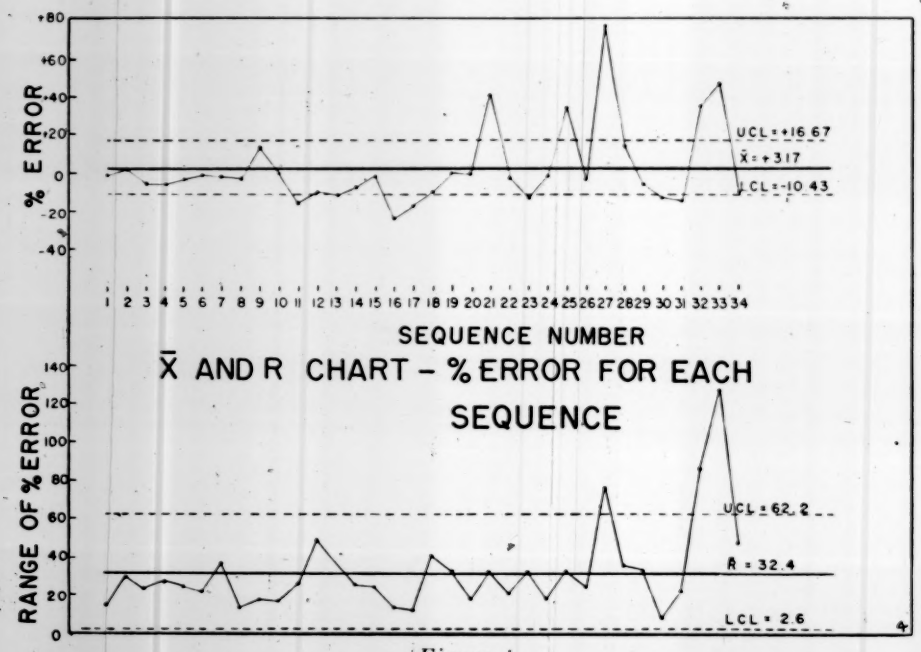

Figure 4

GROUP RATING ANALYSIS TECHNIQUES

Most of these techniques have not been in general use. They give valuable information regarding the accuracy and consistency of the group. Whereas the techniques of the above section can be readily used by each individual, the following techniques are those to be applied by the chairman of the group.

1. **Average Percent Error and Average Standard Deviation of the Group.** Since each individual rater has had his average and standard deviation calculated, it is a simple matter to determine the average percent error and the average standard deviation for the group. In the data presented, the average percent error is +3 and the average of all observers' standard deviations is 23.4%. An important conclusion concerning the group and its rating is that it is inconsistent while accuracy or central tendency is fairly close to zero percent error.

2. **The Standard Error of the Average Group Error.** The average group error for this set of data is +3%. However, the average for the group is not significant by itself. The other statistic necessary is the standard deviation or error of the average. The standard error is calculated by dividing the average standard deviation (23.4) by $\sqrt{N-1}$. In this illustration, the standard error of the group average is 9.55. This means that the true group average would be between +3% and ±9.55, 68% of the time. If the same film were to be shown at a later time to the same group of men, the statistic means the group average could be expected to be anywhere between 3 + 9.55 and 3 − 9.55, 68% of the time. This indicates a rather wide-spread deviation and thereby the reliability of the average of the group, +3%, is not very good.

3. **Standard Deviation For Each Sequence.** By observation the amount of error for each sequence that is rated by the observers is not the same. It is important to find if one sequence has

greater error than others. Those sequences large in error should be investigated to determine if the error was the fault of the film or the method. Using the standard calculational procedure for standard deviation, the standard deviation of percent error of sequence one is 4.8%. This means that the group was rating within ±4.8% of each other 68% of the time for sequence one. This percentage is fairly good. Another illustration is sequence 29 with a standard deviation of 13%. Obviously, such an error is relatively large and must be explained in other ways. It is possible that the large error might be due to the film sequence presentation itself, rather than to the errors and inconsistencies of the observers.

4. **Correlation.** As with correlation in the individual evaluation of ratings, the group average can be correlated with the actual value for each sequence. This correlation would state the relationship of the group rating to the actual rating. For the data presented here, the correlation is .91. This is a relatively good relationship between the group average and the actual rating. The major meaning of this correlation refers to the fact that the group can easily tell when a rating should go up or go down. The correlation indicates that although the group tells when the rating goes up or down, it does not do it accurately.

5. **Regression Equation.** A regression equation can be calculated to predict the group average given an actual rating. The regression equation for this group is $y = .65x + 33.3$. If an actual rating of 100 was indicated, the equation would mean that the group average of these 7 observers would give a value of 98.

6. **$\bar{X}$ and R Chart.** Statistical Quality Control has designed a procedure for determining whether or not various samples from the same population are in control. By converting to percent errors, the ratings form a universe. For each sequence, the average percent error can be calculated and the range found. For example, for sequence one, the average percent error is minus .7. The range for sequence one is 15, found by subtracting the smallest percent error, −7, from the largest, +8. The $\bar{X}$ and R chart made by the usual statistical quality control procedures [3] is shown in Figure 4.

A number of points are out of control on the chart. This serves to indicate that there is some source of error operating on the ratings which have caused them to be beyond the usual limits of variation. It can be assumed that most of the large variations are caused by the film. That is, some of the sequences because of the method, presentation of pace, camera angle, etc., are causing the large variation. An effective way of then checking the ratings would be to eliminate the out-of-control points and their data and re-calculate the information. If subsequent rating practice sessions produce the same type of out-of-control points, it may be assumed that much of the error is due to the rating system.

7. **Range Divided By The Actual Vs. The Actual Rating Graph.** The range for the sequence is the same as in 6 above. The range divided by the actual value for that sequence gives a percent spread of rating. By plotting the percent spread versus the actual rating, the graph of Figure 5 is obtained. This graph helps point out how far apart the members of the group actually rated on a given sequence. It is important to not only keep each individual rater within certain limits, such as ±5%, but to keep all members of the group within certain percent limits of each other.

8. **Epsilon Squared Analysis.** There have been many indications that film has created a source of error in observer's ratings. This indication has been of a qualitative nature in that no direct figure has been expressed for the amount of error due to the film alone. The epsilon squared technique gives a quantitative measure of the errors in rating which are attributable to the film

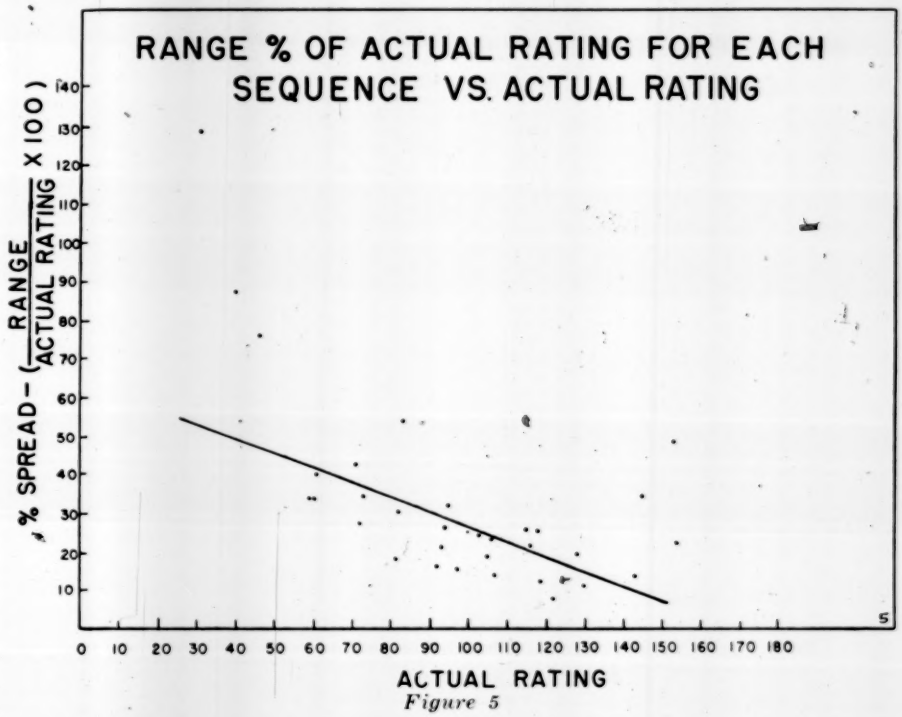

Figure 5

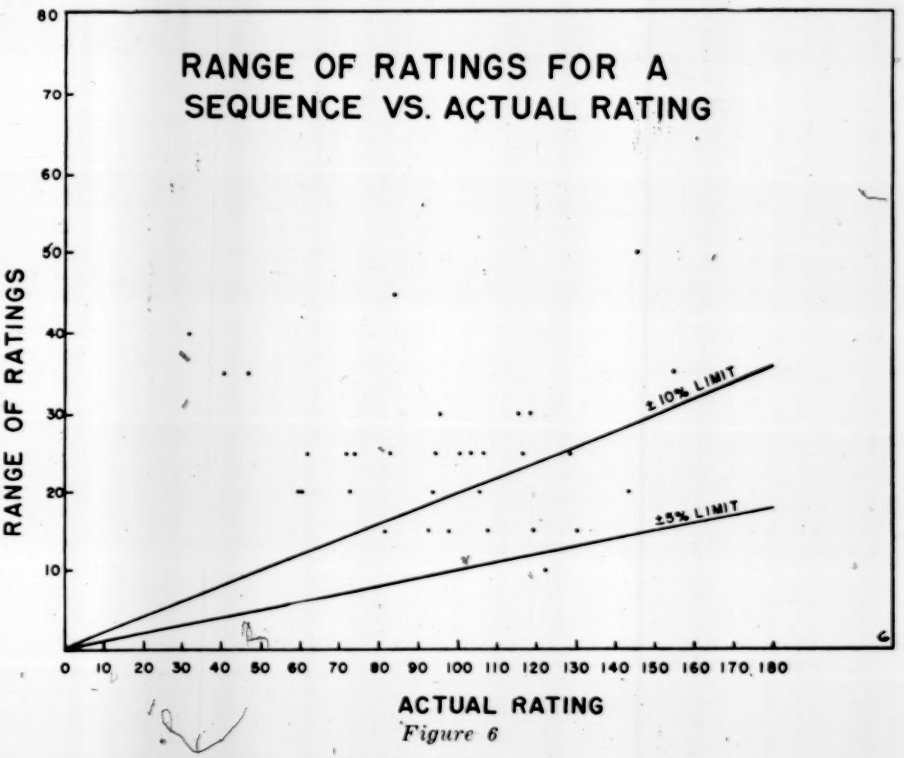

Figure 6

[3] Grant, E. L., **Statistical Quality Control**, 2nd ed., McGraw-Hill: New York, 1952.

itself. The technique is simple and the standard calculational procedure [4] is used. Epsilon squared finds the significance of difference for the variable under consideration. For example, it was found that there was no significant difference among average ratings for each observer. This is evident since the range of the average percent errors is only 5%. The Epsilon squared technique indicates this by an actual significance test.

Applying the Epsilon squared technique to the film sequences it was found that there was a significant difference among the sequences of film. The significance was far beyond the 1% level of confidence. This significance indicates that there is a law relating the percent error of rating to each of the film sequences. Taking the square root of Epsilon square gives the curvilinear correlation of the percent error to the film sequences. This corre ation between film sequences and percent of error is .822. The conclusions indicate that the errors obtained were due largely to the film sequences and not to the observers. This technique is exceptionally useful because film showing such large errors should not be used in trying to test the accuracy and consistency of time study raters.

The Epsilon squared technique can also be applied to each of the jobs involved in the rating film. For example, a number of the sequences were made of the same job. This technique can be used to determine whether or not the film of a particular job has caused more error than the observer. For example, the last two jobs comprising the last 11 sequences were found to have a 5% level of confidence in relating percent error to the film sequences. In a like manner, the two jobs comprising the first nine sequences were found to be highly insignificant in relating errors to film, thereby indicating that perhaps these sequences and jobs could be used for a check on the rating of the observers. Analysis of variance is a similar technique, but it cannot be used to determine correlations as can Epsilon squared.

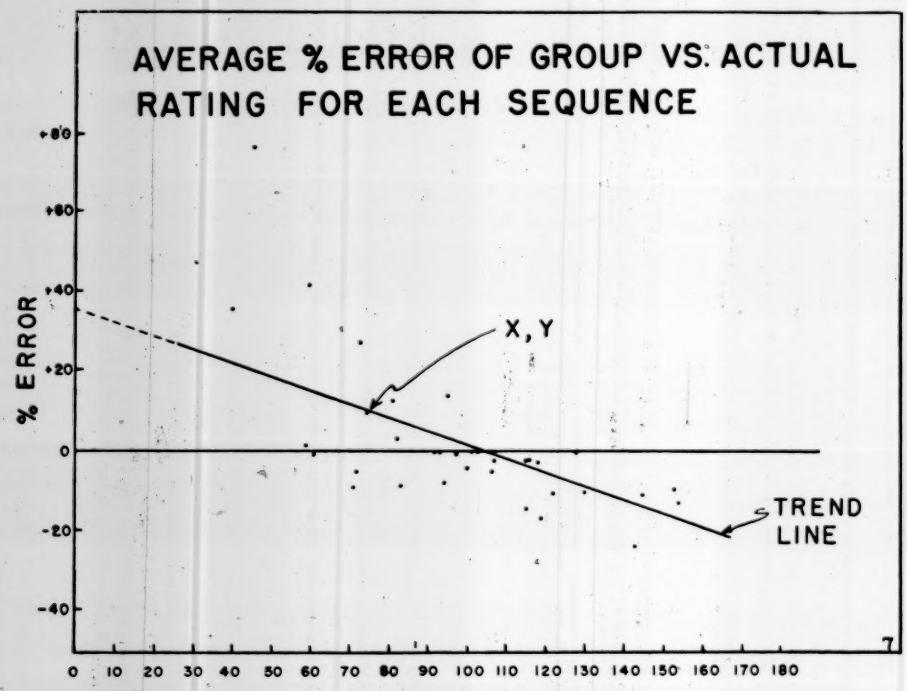

Figure 7

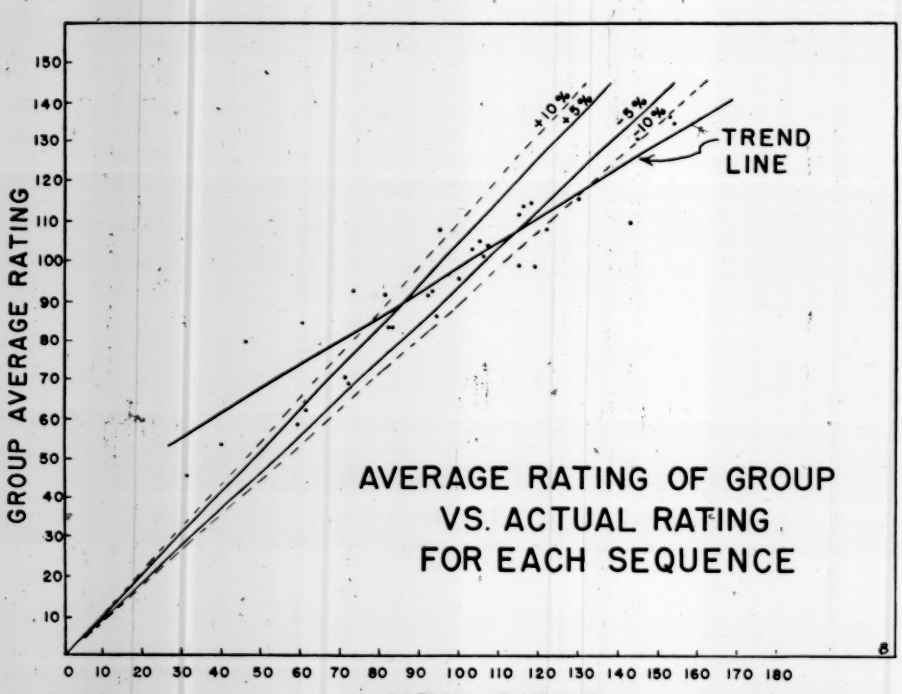

Figure 8

9. **Range Of Ratings For A Sequence Vs. The Actual Ratings With ±5 and 10% Limits.** This graph is shown in Figure 6. It affords an easy opportunity to see how much alike the group is rating for various actual ratings. It is desirable to have the group rating within the ±5% limits. However, this chart shows what is actually done.

10. **Percent Error Versus Actual Rating Graph.** This graph is the same for the group as was shown for the individual in item 6. The slope of the trend can likewise be calculated. The slope of the trend line in Figure 7 is —.35.

11. **Actual Rating Versus Group Average Graph.** Figure 8 is the same presentation for the group as Figure 2 is for the individual. It represents an easily explained picture of the group's rating.

The analysis techniques presented for an individual are valuable for comparing each individual of a group with the other members of the group. The chairman of the rating group is frequently more interested in a man-to-man comparison than in what the group as a whole is doing. The group techniques tell only what the group as a whole is doing. The individual techniques can then be used for man-to-man comparisons.

The above techniques for the analysis of individual and group ratings, represent a review of and some additional ways of learning how ratings are being made in an organization. Not all of the possible analysis techniques are presented above. However, many of the latest techniques which have been developed for possible use are presented.

Some of the techniques tend to tell some of the same things as others. Obviously, when analyzing the same group of ratings, there will be some degree of overlap. Individuals attempting to analyze ratings should select the technique or techniques which are the most useful for their own situations. With the techniques listed above, any organization or individual should be able to learn more about what can be done to improve rating.

[4] Peters and Van Voorhis, loc. cit.

MEDIATION & CONCILIATION

(Continued from Page 15)

corrected. This can best be accomplished at a time when there is no impending resort to economic force. The causes are many—misunderstanding, distrust, frustration of normal human desires, lack of, or faulty communications, failure to accept the concept of collective bargaining—these are but a few.

We are attempting to assist parties to ferret out these sore spots so they can take remedial action. Such a task requires all the skills and abilities at the mediator's command. He must be alert to the existence of these irritants and be prepared to suggest methods by which they can be eradicated. Wherever we have been able to obtain the cooperation of the parties the results have been gratifying. While I can cite many examples let me just make mention of one.

For many years in a western seaport, negotiations between the Shipping Association and the Shipping employees were marked by bitterness and strikes which were long and costly. Apparently neither side made any concrete attempt to understand the other's position and problems or to dispel the distrust which had arisen between them. One of our Commissioners felt that such a condition could only be a source of recurrent strife unless something was done about it. During the life of the contract, he spent many hours talking separately to the representatives of each group and attempted to discover the basic causes of the poor relationship. Finally, he suggested that both sides attend a luncheon which he arranged for the purpose of discussing general problems of mutual interest. His guests approached the idea with reluctance and understandable skepticism. However, when they broke bread together they were astonished to find that the other fellow was not all selfish but certainly had some worthwhile ideas. From this simple method of achieving understanding, both sides voluntarily set up periodic meetings at which problems confronting the industry were explored. When the contract terminated, bargaining for a renewal was conducted in an objective and orderly manner. For the first time in a long period, negotiations resulted in an agreement without resort to economic force by either side.

We are determined to continue this type of work as well as our work in the settlement of current disputes. Each are properly mediation functions.

There can be little question as to the ever increasing role mediation shall play in the resolution of labor-management disputes. President Eisenhower has on a number of occasions stated that his administration shall place greater reliance on collective bargaining free from government dictation or control. To achieve this end, he has committed his administration to the policy of strengthening and increasing the prestige of the mediation facilities of the federal government.

As a way of peace in all areas of human conflict, mediation is being recognized as the only desirable and enduring alternative to subjugation and conflict.

As Paul Henri Spaak has stated:

"Mediation and conciliation are playing a greater and greater role in relations between classes and nations. This is fortunate. It is a manifestation of a tendency in which one can fully rejoice. It is an expression of one of the highest virtues which can be practiced: the desire to understand and be just toward one another. "Each time that one attempts to resolve a conflict without force one renders to men an enormous service in leading them in the path of wisdom and of respect for themselves and for each other."

Book Review

"Introduction to Engineering Economy,"
Second Edition, by Baldwin M. Woods and E. Paul DeGarmo,
New York, The Macmillan Company, New York, 1953, 519 pages, $6.00

In this clear and lucid work, Woods and DeGarmo present the fundamental ideas of engineering economy in a form suitable for the industrial engineer without extensive training in the subject. They emphasize capital investment and discuss the effects of income taxes.

The book also includes sections on accounting, cost accounting, personnel, statistical quality control, and service life expectancy by statistical methods. Although brief, these sections can serve as an introduction to those with engineering training.

Book Review

"Kinematics of Machines,"
by Rolland T. Hinkle,
Prentice-Hall, Inc.
New York, 1953, 231 pages, $4.75

This volume is brief, yet covers the essentials of kinematics of machines. Prof. Hinkle has provided many good illustrations and diagrams both theoretical and practical. He covers the essential theory and industrial applications such as chains and belts, cams, gears and gear trains.

Book Review

FACTORY FOLKWAYS,
by John S. Ellsworth, Jr.,
Yale University Press,
New Haven, Conn., 1952, 284 pages, $4.00

Factory Folkways, A Study of Institutional Structure and Change, should make interesting reading for all Industrial Engineers. It is a case study of the changing institutional character of a medium-small sized plant. Many of the happenings and the resulting changes will seem quite similar to those in the reader's own experience and background. The analysis, which shows the direct results of Industrial Engineering activity as well as the situation within which Industrial Engineering work must be done, will be of interest to the Industrial Engineer and management personnel.

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